

## THE ATYIDAE OF MADAGASCAR

by

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The present paper is based in the first place on an extensive collection of Atyidae from all over Madagascar which is the property of the Institut de Recherche Scientifique de Madagascar at Tananarive; this material was placed at my disposal by Dr. R. Paulian, formerly deputy director of that Institute, for which I wish to tender him my deeply felt gratitude. Also incorporated in this report is the important collection of Madagascar Atyidae brought together during the "Oesterreichischen Madagaskar-Expedition 1958", which was entrusted to me for study by the leader of the expedition, Dr. F. STARMÜHLNER of the Zoological Institute of Vienna University to whom I like to express my sincere thanks. The few specimens of Madagascar Atyidae present in the Leiden Museum are also taken into account. Just before the manuscript was finished a small but interesting collection of Madagascar Atyidae was received by the Leiden Museum. For this collection, which is also dealt with here, I am most indebted to Mr. Y. THEREZIEN, ingénieur-hydrobiologiste of the Centre Technique Forestier Tropical of Tananarive. The Madagascar Institute donated duplicates of its collection to the Leiden Museum, which obtained also the entire collection of the Austrian Expedition.

In order to make this paper of more use to those workers in Madagascar interested in the Atyid fauna of the island, all species so far reported from Madagascar and not represented in the above collections have been listed here also. In this way the present report gives a complete review of the actual state of our knowledge of this group. In the synonymy of each species a reference to the original description is given, as well as references to all Madagascar records of the species that are known to me; also a full enumeration of the localities from where the species has been reported is provided.

At present 5 genera and 23 species of Atyidae are known from Madagascar. The genera may be distinguished with the help of the following key :





1. Exopods on all pereopods. Eyes degenerate, cornea absent or strongly reduced. Rostrum short, slender, without teeth ..... 2
  - Exopods absent from all pereopods. Cornea well developed or reduced, always with pigment. Rostrum with or without teeth ..... 3
2. Eyes without any pigment, bullet shaped. Pterygostomian spine absent. Second maxilliped without podobranch. Endopod of first male pleopod with appendix interna ..... *Typhlopatsa*
  - Eyes with a strongly reduced poorly pigmented cornea placed on the anterolateral angle of the broad peduncle. Eye broad, quadrangular, excavate anteriorly. Second maxilliped with podobranch. Endopod of first male pleopod tapering to a narrow elongate tip, without appendix interna..... *Antecaridina*
3. First pereopod without arthrobranch. Cornea reduced or well developed ..... *Parisia*
  - First pereopod with arthrobranch and pleurobranch. Cornea always well developed ..... 4
4. Carpus of second leg elongate, more than three times as long as high, not deeply excavated. Chelae always with a well developed palmar portion ..... *Caridina*
  - Carpus of second leg less than twice as long as high, deeply excavated. Dactylus of cheliped usually as long as propodus and articulating at base of propodus so that there is no palmar portion ..... *Atya*

Genus **TYPHLOPATSA** Holthuis, 1956

Only one species known :

***Typhlopatsa pauliani*** Holthuis

*Typhlopatsa pauliani* Holthuis, 1956, p. 53.

*Typhlopatsa Pauliani* Holthuis, 1956a, p. 98, fig. 1.

For the description of the species I may refer to the second of the above cited references.

The species is cavernicolous and so far was found only in the Mitoho Cave, NE corner of Tsimanampetsotsa Lake, Mahafaly Province, SW Madagascar.

Genus **ANTECARIDINA** Edmondson, 1954

The genus is monotypic, the only species is :

*Antecaridina lauensis* (Edmondson) (fig. 2)

*Mesocaris lauensis* Edmondson, 1935, p. 13, fig. 4.

MADAGASCAR INSTITUTE :

— Europa Island, W of Madagascar ; saline pool ; June 1951 ; R. Paulian. — 12 specimens.

The specimens are 10 to 15 mm long.

The rostrum is unarmed above and below, it is rather slender and reaches about to the middle of the second segment of the antennular peduncle. In dorsal view it is elongately triangular. There is no supra-orbital spine. The antennal spine is placed on the lower orbital angle, it is well developed and sharp. A conspicuous pterygostomial tooth is present.

The telson dorsally bears none to two, generally two pairs of spinules. The posterior margin of the telson is rounded, bears a short outer pair of spinules, a lateral pair which is more than 5 times as long as the outer pair and 3 to 5 intermediate spines, the outer of which are longest.

The eyes have the cornea strongly reduced, forming only a small rounded poorly pigmented swelling on the outer anterolateral corner of the peduncle, which itself is distinctly shorter than broad.

The segments of the antennular peduncle are short. The stylocerite is long and slender and reaches distinctly beyond the base of the second segment. The anterolateral angle of the first segment is only slightly produced.

The scaphocerite is oval, with a short final tooth on the outer margin. This tooth is far outreached by the lamella. At the base of the scaphocerite the antennal peduncle shows a strong spine.

The mouth parts are of the normal type. They are figured here.

The branchial formula runs as follows :

	MAXILLIPEDS			PEREIOPODS				
	1	2	3	1	2	3	4	5
Pleurobranchs	—	—	—	1	1	1	1	1
Arthrobranchs	—	—	2	—	—	—	—	—
Podobranchs	—	1	—	—	—	—	—	—
Epipods	rud.	1	1	1	1	1	1	—
Exopods	1	1	1	1	1	1	1	1

The first pereopod has the fingers about as long as the palm. The carpus is deeply hollowed anteriorly and is more than twice as long as high, shorter than the chela and somewhat longer than the merus. The second pereopod is more slender and longer than the first. The fingers are longer than the palm. The carpus is fully 4 times as long as high and much longer than either chela or merus. In the third leg the dactylus ends in two claws, while three slender spines are placed on the posterior margin. The propodus is more than 2.5 times as long as the dactylus. The carpus bears a distal movable spine, the merus has a similarly situated spine and 4 movable spines on the posterior margin ; a movable spine may also be seen on the ischium. In the fifth leg the dactylus also ends in two claws, on the posterior margin there

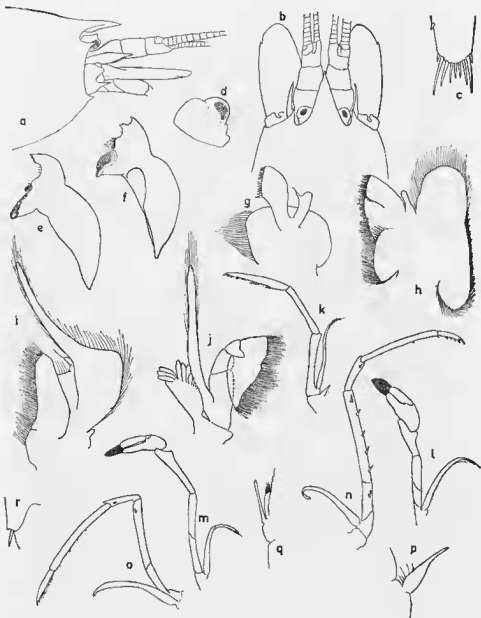


FIG. 2. — *Antecardina lauensis* (Edmondson). a, anterior part of body in lateral view; b, anterior part of body in dorsal view; c, tip of telson; d, eye; e, f, mandible; g, maxillula; h, maxilla; i, first maxilliped; j, second maxilliped; k, third maxilliped; l, first pereopod; m, second pereopod; n, third pereopod; o, fifth pleopod; p, endopod of first pleopod of male; q, appendix interna and appendix masculina of second pleopod of male; r, outer part of diaeresis of uropodal exopod. a, b, k-o,  $\times 16$ ; e-f, p-r,  $\times 33$ . All figures after specimens from Europa Island.

is a row of short hairs. The propodus is slightly more than twice as long as the dactylus. Both merus and carpus have a distal movable spine, no other such spines are seen here.

The endopod of the first pleopod of the male is oval, tapering to a slender elongate tip. The appendix masculina of the second male pleopod is much shorter than the very slender appendix interna, it bears a tuft of strong setae on the top. The outer margin of the exopod of the uropods ends in a small tooth, to the inside of which a slender movable spine is placed; there are no other spines on the diaeresis.

Colour. EDMONDSON described the species as being bright red when alive. No information about the colour of the Madagascar specimens is available.

The species so far was known only from two localities in the Lau Islands, Fiji Group, Polynesia, viz., Numbu Cave on Namuka Island, and Wangavu Island. The water in Numbu Cave is brackish, on Wangavu Island the species was found in a salty lake. The present record of the species from a salt water pool on Europa Island confirms the preference for salt water of this species, an unusual feature in the present family which always is considered to be a typical freshwater group.

The fact that the species is found in localities geographically so widely apart as Europa Island and the Fiji Archipelago makes it very probable that it will be found also in the intermediate area (1).

RATHBUN (1906, p. 919, fig. 67) dealt with small vermilion Atyids found "in small fresh or slightly brackish water pools in lava flow, near sea" 5 miles south of Puako Bay near Hilo on the island of Hawaii. Judging by her account the specimens are extremely close to *Antecaridina lauensis*, differing mainly by the shorter rostrum and the less slender second pereopod. The absence of a stylocerite in Rathbun's drawing evidently is an omission by the artist. Without reexamination of Rathbun's material it is impossible to place the species, but it does not seem probable that her identification with *Caridina brevistris* Stimpson is correct, the latter is a true freshwater form, probably belonging to the genus *Caridina* (1).

*Antecaridina* Edmondson forms with the genera *Typhlatya* Creaser, *Speleocaris* Matjasič, *Typhlopata* Holthuis and *Stygiocaris* Holthuis, a homogeneous section of the family Atyidae, quite distinct from BOUVIER's (1925, pp. 40-42) série paratyenne, série caridienne and série caridinienne; it could well be named série typhlatyenne.

(1) Note with the correction: since the above was written, a paper, entitled "on red coloured shrimps (Decapoda, Caridea) from tropical land-locked saltwater pools", was published (HOLTHUIS, 1963, *Zool. Meded. Leiden*, vol. 38, pp. 261-279, figs. 1, 2); in this publication *Antecaridina lauensis* is reported from the southern Red Sea, while some additional information on the habitat of the present Madagascar specimens of that species is provided. In the same paper RATHBUN'S "*Caridina brevistris*" is described as a new genus and new species under the name *Halocaridina rubra*.

Genus **PARISIA** Holthuis, 1956

The genus consists of three species, all of which inhabit Madagascar. They may be distinguished as follows :

1. Eyes strongly reduced with only a small pigment spot. Antennal spine merged with the lower orbital angle ..... 2
- Eyes with the cornea well developed and rounded, provided with dark pigment. Antennal spine distinctly separated from the lower orbital angle. Rostrum well developed, with teeth on both upper and lower margins ..... *macrophthalma*
2. Rostrum well developed, reaching about to the end of the antennular peduncle, with teeth on both upper and lower margins .... *microphthalma*
- Rostrum short, not reaching beyond the eyes, without either dorsal or ventral teeth ..... *edentata*

**Parisia edentata** Holthuis

*Parisia edentata* Holthuis, 1956, p. 55 ; Holthuis, 1956a, p. 105, fig. 3.

For the description of the species I refer to the last mentioned reference.

The species is only known from the southern part of the Antsingy Mts. between the Manambolo and Morafenobé rivers near Bekopaka, Majunga province, W Madagascar ; in a very dark deep well.

**Parisia microphthalma** (Fage)

*Caridina microphthalma* Fage, 1946, p. 324, figs. 1, 2.

*Parisia microphthalma* Holthuis, 1956, p. 54 ; Holthuis, 1956a, p. 103, fig. 2.

Descriptions and figures of the species have been given by FAGE (1946) and HOLTHUIS (1956a), to which I may refer here.

So far the species has been collected only in the Grotte des Fanihy, Ankarana Mts., N of Ambilobé, N Madagascar, in a fresh water pool in total darkness.

**Parisia macrophthalma** Holthuis

*Parisia macrophthalma* Holthuis, 1956, p. 55 ; Holthuis, 1956a, p. 107, fig. 4.

For a description and figures of the species I refer to the last cited reference.

The species was found together with the previous one in the Grotte des Fanihy, Ankarana Mts., N of Ambilobé, N Madagascar, in a fresh water pool in total darkness.

Genus **CARIDINA** H. Milne Edwards, 1837

The genus *Caridina*, which in Madagascar is represented by at least 16 species, is one of the notoriously difficult genera of Decapoda Macrura. Even BOUVIER's (1925) monograph of the Atyidae did not put an end to these difficulties. Several of the characters used by BOUVIER to distinguish between his species (and subspecies) prove to be too variable to be of great value; this is especially true of most of the relative measurements. To several other characters too little importance was attached by BOUVIER.

As is clearly shown by the present material, local populations may show a remarkable constancy in certain characters, while if representatives of various populations of a whole species are considered, these characters vary greatly, often linking two forms, which at first sight seem to represent distinct species. For this reason an exact knowledge of the various species of *Caridina* of Madagascar can only be obtained by a zoologist who is stationed in Madagascar and can explore the fauna of all the different river systems and study the influence of locality, environment and age on the various characters. Only in this way a correct idea of the species, their variability and their mutual relations can be obtained.

It is the purpose of the present paper, to place in the hands of such a zoologist all the data concerning our present knowledge of the Madagascar Atyidae so that it may serve as a foundation on which a final revision of this fauna can be based.

It will be of the utmost importance to know the changes which each species undergoes in growing up. The material at hand shows that there are considerable differences between juvenile and adult specimens, but the actual relation is not sufficiently well known. Also the influence of the habitat on certain characters is important. So GORDON (1930) pointed out that in lacustrine specimens of *C. nilotica* the rostrum and also the appendages are more slender than in specimens from shore collections. As in most instances little or nothing is known about the conditions under which the present material lived, hardly anything could be done in this respect. Both the inter- and the intra-population variation should be given all attention in order to make a solution of the species problem of the Madagascar *Caridina* possible. I fully realize that my present attempts in this direction are very feeble, and though I am sure that several of my conclusions will prove to be incorrect, I present these my results with the hope that they will be a stimulus to someone with more favourable facilities to untie the numerous knots that still are left (or perhaps even added to) the systematics of the Madagascar *Caridina* species.

The following key to the Madagascar species of *Caridina* is only intended as a first attempt. Especially the last part (7 and beyond) should be used with some reserve as the variability of the various characters employed



is rather great. *C. brevisrostris brevipes* is not inserted in this key as too little is known of this form.

1. Endopod of first pleopod of male with appendix interna . . . . . 2
- Endopod of first pleopod of male without appendix interna . . . . . 6
2. Upper border of rostrum without teeth. Rostrum short, not reaching beyond second segment of antennular peduncle. Intermediate spines on posterior margin of telson longer than the lateral pair. Antennal spine placed on the lower orbital angle . . . . . *typus*
- Upper border of rostrum with teeth. Intermediate spines on posterior margin of telson as long as or shorter than the lateral pair . . . . . 3
3. Rostrum straight and short, not reaching beyond the second segment of antennular peduncle. Distal part of upper margin of rostrum unarmed, no subapical teeth present. Antennal spine placed on lower orbital angle . . . . . *japonica*
- Rostrum with the distal part curved up, reaching distinctly beyond second segment of antennular peduncle. Distal part of upper margin of rostrum unarmed apart from one or more subapical teeth. Antennal spine placed below the very distinct lower orbital angle . . . . . 4
4. Posterior margin of telson ending in a median point. Preanal carina with a sharp posteriorly directed spine. Eggs numerous and small ( $0.2 - 4.0 \times 0.3 - 0.6$  mm). . . . . 5
- Posterior margin of telson rounded. Preanal carina blunt without a spine. Eggs fewer and larger ( $0.5 - 0.6 \times 0.7 - 1.0$  mm) . . . . . *nilotica*
5. Dorsal margin of rostrum with 13 to 23 spines in basal part, which are placed close together . . . . . *longirostris*
- Dorsal margin of rostrum with 5 to 13 spines in the basal part, which are placed widely apart . . . . . *gracilirostris*
6. 6 to 8 spines of the dorsal margin of the rostrum placed behind the orbit. Stylocerite reaching distinctly beyond the base of the second segment of the antennular peduncle. Intermediate spines of posterior margin of the telson larger than the lateral pair . . . . . *serratirostris*
- 0 to 6 spines of the dorsal margin of the rostrum placed behind the orbit. Stylocerite at most attaining the end of the first segment of the antennular peduncle . . . . . 7
7. Intermediate spines of the posterior margin of the telson longer than the lateral pair, with a chitine plug in the middle . . . . . 8
- Intermediate spines of the posterior margin of the telson shorter than the lateral pair . . . . . 10
8. Anterior margin of carpus of first cheliped deeply excavated; this carpus less than twice as long as wide, shorter than the chela. Lower margin of rostrum with about 8 teeth; upper margin with 0 to 16 . . . . . *argulata*
- Anterior margin of carpus of first cheliped not deeply excavated, carpus itself more than twice as long as wide, longer than the chela . . . . . 9
9. Upper margin of rostrum with 10 to 13 teeth . . . . . *petiti*
- Upper margin of rostrum without teeth, seldom with 1, rarely with 7 . . . . . *calmani*

10. Dactylus of third pereopod with 15 to 17 teeth on posterior margin. . . . . *edulis*  
 — Dactylus of third pereopod with 3 to 7 teeth on posterior margin. 11
11. Upper margin of rostrum without teeth, rostrum short . . . . . 12  
 — Upper margin of rostrum with teeth . . . . . 13
12. Diaeresis with 7 to 13 spinules . . . . . *isaloensis isaloensis*  
 — Diaeresis with 20 to 23 spinules . . . . . *lamiana*
13. 4 to 6 of the dorsal teeth of the rostrum placed behind the orbit. Posterior margin of telson stepped . . . . . *troglophila*  
 — 0 to 3 of the dorsal teeth of the rostrum placed behind the orbit . 14
14. Rostrum in adult specimens very long, reaching much beyond the antennular peduncle. Ultimate part of upper margin of rostrum without teeth . . . . . *xiphias*  
 — Rostrum in the adults shorter than the antennular peduncle or, if longer, with a subapical tooth . . . . . 15
15. Rostrum in adults usually not reaching beyond the base of the third antennular segment, evenly dentate or with a short distal unarmed space . . . . . 16  
 — Rostrum as long as or longer than antennular peduncle, with a distinct unarmed stretch behind the subapical tooth . . . . . *norvestica*
16. Dorsal teeth of rostrum very high and strong . . . . . *hova*  
 — Dorsal teeth of rostrum small . . . . . *isaloensis grandidieri*

***Caridina typus* H. Milne Edwards (fig. 3)**

*Caridina typus* H. Milne Edwards, 1837, p. 363, pl. 25bis, figs. 4, 5; Coutière, 1900, p. 1267; Bouvier, 1904, p. 134.

*Caridina typa* Bouvier, 1905, p. 88.

*Caridina typus typica* Bouvier, 1925, p. 250, figs. 272-295.

MADAGASCAR INSTITUTE :

- Ankavandra on Manambolo River, W Madagascar; July 1949; R. Paulian. — 1 specimen.  
 — Betsingly on Manambolo River, W Madagascar; July 1949; R. Paulian. — 7 specimens.  
 — Mahilaka, Bay of Ampasindava opposite Nosy Bé, NW Madagascar; 1946; J. Millot. — 3 specimens.  
 — Bas-Sambirano near Ambanja, mainland opposite Nosy Bé, NW Madagascar; swamp; June 1948; J. Millot. — 4 specimens.  
 — Orangea near Diégo-Suarez, N Madagascar; cave; 1946; J. Millot. — 5 specimens (2 ovigerous).  
 — Tamatave, E. Madagascar; fresh water; April 1951; R. Paulian. — 8 specimens.

AUSTRIAN MADAGASCAR EXPEDITION :

- Djabalabe rivulet, Nosy Bé; 18 and 20 August 1958; F.M. 157, 163. — 17 specimens.  
 — Djabala rivulet, Nosy Bé; 22 August 1958; F.M. 171. — 2 specimens.  
 — Pasandava rivulet, Nosy Bé; 16 August 1958; F.M. 145. — 48 specimens.  
 — Andranobe rivulet, Nosy Bé; 17 August 1958; F.M. 149. — 9 specimens.  
 — Anjiamarango rivulet, Nosy Bé; 21 August 1958; F.M. 168. — 9 specimens.  
 — Amporaha rivulet, Nosy Bé; 16 August 1958; F.M. 146a. — 6 specimens.

## MUSEUM LEIDEN :

— Andrarony River, Antalaha district, Diégo-Suarez province, N E Madagascar ; 8 km from the mouth of the river ; 7 February 1962; native name « orangaratra »; Y. Thezein no. 34. — 3 specimens (2 ovigerous).

— Ambodiriana, Tamatave district, Tamatave province, E Madagascar; July 1957; native name « orana »; Y. Therezien no. 2. — 4 females (3 ovigerous).

The largest specimen is 36 mm long; the ovigerous females measure 24 to 36 mm.

The rostrum of this species is short, in the present material it reaches to the base or almost to the end of the second segment of the antennular peduncle. The upper margin is entire, the lower margin bears 1 to 3 (rarely up to 6) ventral teeth.

The antennal spine is placed on the lower orbital angle and is completely fused with it. The pterygostomial angle is rectangularly rounded.

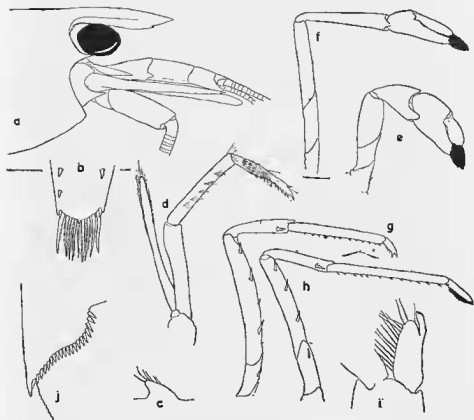


FIG. 3. — *Caridina typus* H. Milne Edwards, from Andrauobe rivulet, Nosy Bé. a, anterior part of body in lateral view; b, tip of telson; c, pre-anal carina; d, third maxilliped; e, first pereopod; f, second pereopod; g, third pereopod; h, fifth pereopod; i, endopod of first pleopod of male; j, outer part of diacresis. a, d-h,  $\times 16$ ; b, c, i, j,  $\times 33$ .

The dorsal surface of the telson bears 5 or 6 rarely 4 pairs of spines. The posterior margin of the telson ends in a small sharp point, the posterolateral angles are somewhat produced. The outer spines of the posterior margin are placed somewhat over the lateral spines and are very short. The lateral spines are long (more than 5 times as long as the outer spines) and strong. The intermediate spines are 4 to 9 in number and are slightly longer than the lateral spines, they are divided in two by a kind of chitin plug.

The eyes are well developed.

The stylocerite reaches beyond the middle of the basal segment of the antennular peduncle but fails to reach the end of the segment. The antero-lateral angle of the segment is pointed and short and fails to reach the end of the basal 1/4 of the second segment. There is a rather broad and sharp tooth at the outer margin of the antennal peduncle near the base of the scaphocerite.

Epipodites are present on the first 4 pereopods.

The carpus of the first chelipeds is about 1.5 times as long as high and deeply hollowed anteriorly, it is about as long as the merus and shorter than the chela. In the second leg the carpus is about 5 times as long as high, not deeply excavated anteriorly and longer than either merus or chela; the fingers are much longer than the palm. The propodus of the third pereopods are about 4 times as long as the dactylus, the latter bears 5 or 6 teeth on the posterior margin. The propodus of the 5th leg is 3 1/2 to 4 1/2 times as long as the dactylus which is armed with numerous closely placed comb-like arranged spinules.

The first pleopod of the male has a distinct appendix interna on the endopod. In BOUVIER's (1925, p. 127, fig. 293) illustration of the endopod, the appendix evidently is folded so that it obtains a rather peculiar shape there; as shown by the present material the appendix is perfectly normal. The appendix masculina of the second male pleopod is almost twice as long and twice as broad as the appendix interna.

On the exopod of the uropods the diaeresis bears 20 to 23 spinules.

The eggs are numerous and small. In the present specimens they measure  $0.2 \times 0.4$  mm.

*Caridina typus*, the type species of the genus, has a very wide distribution in the Indo-West Pacific area, ranging from East Africa to Japan and Polynesia. The previous records from Madagascar are: Madagascar (COUTIÈRE, 1900), Tuléar, SW coast (BOUVIER, 1904, 1925), Diégo-Suarez, NE coast (BOUVIER, 1904, 1925), torrents of Antongil Bay, NE coast (BOUVIER, 1904, 1905, 1925), Fort-Dauphin, SE coast (BOUVIER, 1904, 1925).

### *Caridina japonica* De Man (fig. 4)

*Caridina japonica* De Man, 1892a, p. 261, pl. 9, fig. 7.

#### MUSEUM LEIDEN:

— Ambodiriana, Tamatave district, Tamatave province, E Madagascar; July 1957; native name «orana»; Y. Theresien no. 2. — 1 specimen.

— Beforona River, Périnet region, Moramanga district, Tamatave province; 11 February 1961; native name «orana»; Y. Theresien no. 10. — 1 specimen.

— Brook near the city limits of Ifanadiana, Ifanadiana district, Fianarantsoa province, E Madagascar; 20 February 1962; native name « tsipitika »; Y. Therezien no. 22. — 1 specimen.

— Tolongoina River, Fort-Carnot district, Fianarantsoa province; 21 February 1962; native name « patsa »; Y. Therezien no. 18. — 1 specimen.

The specimens, all of which are males, are 24 to 38 mm long.

The rostrum reaches somewhat beyond the base of the second segment of the antennular peduncle. It is rather high and straight. The upper margin bears 16 to 22 small movable teeth, all of which are placed on the rostrum proper; they are close together and leave the ultimate  $1/4$  or  $1/5$  of the upper margin unarmed; no subapical teeth are present. The first dorsal tooth is placed over or slightly before the posterior limit of the orbit. The lower margin of the rostrum bears 7 to 12 immovable, rather small teeth. The lateral carina of the rostrum is quite distinct in the basal part and merges with the orbital margin.

The antennal spine is placed on the lower orbital angle; it is quite strong. The pterygostomial angle is broadly rectangularly rounded and hardly forwards produced.

The sixth abdominal somite is about 0.5 to 0.6 times as long as the carapace. The telson bears 5 or 6 pairs of dorsal spinules, sometimes a seventh spinule is present on one side. The posterior margin of the telson ends in a short median tooth. The outer pair of posterior spinules is short, it does not reach beyond the basal fourth of the lateral spines. There are 6 to 9 intermediate spines which are almost as long as the laterals; they are provided with fine setae. The preanal carina is produced to form a blunt-topped triangular lobe; it bears no spine.

The eyes are well developed with a globular well-pigmented cornea. The antennular carina is dorsally produced to a high and bluntly topped lobe. The antennula is short and robust with the various segments relatively short and broad. The stylocerite is slender and sharply pointed; it reaches beyond the middle of the basal antennular segment, but fails by far to reach the end of it. The antero-lateral tooth of the basal segment is well developed and measures about  $1/4$  of the length of the second segment. The second segment is much shorter than the first and slightly longer than the third. The outer margin of the scaphocerite is about straight and ends in a sharp tooth which practically attains the end of the antennular peduncle; it is far overreached by the lamella. A sharp triangular tooth is present on the antennal peduncle near the external part of the base of the scaphocerite.

The branchial formula is typical for the genus. Epipods are present on the first four pereopods. The third maxilliped reaches to or with part of the distal segment beyond the antennular peduncle. The length of the ultimate segment is  $4/5$  of, or almost equal to that of the penultimate; it ends in a dark tooth and bears some spines in the distal part of the posterior margin.

The carpus of the first pereopod is about twice as long as high; it is deeply excavated anteriorly. It is about as long as the merus, and shorter than the chela. The chela is robust; the fingers are somewhat longer than the palm. The second legs are more slender. The carpus is more than 5 times as long as high; it is longer than either merus or chela. The fingers of the

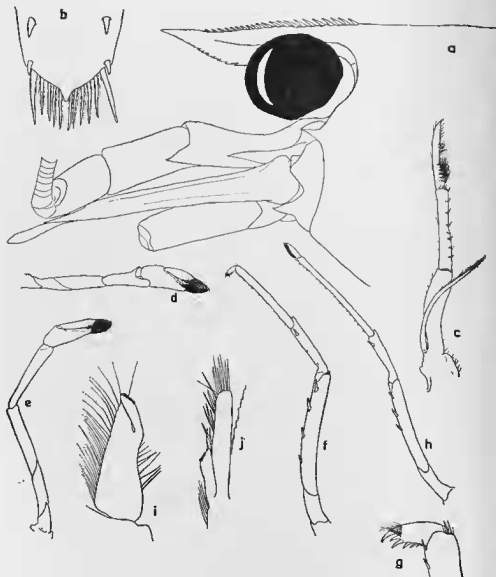


FIG. 4. — *Caridina japonica* De Man. *a*, anterior part of body in lateral view; *b*, tip of telson; *c*, third maxilliped; *d*, first pereopod; *e*, second pereopod; *f*, third pereopod; *g*, dactylus of third pereopod; *h*, fifth pereopod; *i*, endopod of first pleopod of male; *j*, appendix masculina and appendix interna of second pleopod of male. *a*,  $\times 16$ ; *b*, *g*, *i*, *j*,  $\times 32$ ; *c*-*f*, *h*,  $\times 8$ . *a*, specimen from Manadiana; *b*, specimen from Beforona River; *c*-*j*, specimen from Tolongoina River.

chela are slightly more than 1.5 times as long as the palm. The dactylus of the third pereopod ends in a dark claw, its posterior margin bears 5 to 7 additional teeth, the distal of which is distinctly smaller than either the tooth that precedes it or the final claw; from the second to the proximal,

the posterior teeth diminish regularly in size. A row of hairs is implanted on the lateral surface of the dactylus at the base of the distal two teeth. The propodus is about 5 times as long as the dactylus and bears a row of about 10 to 15 spinules on the posterior margin. The carpus is 0.7 to 0.8 times as long as the propodus. It bears a strong movable spine in the distal part of the outer surface; a few small spinules may be observed more proximally. The merus is about twice as long as the carpus; it bears 3 or 4 strong spines on the outer surface near the posterior margin. The ischium bears no movable spine. The dactylus of the fifth pereopod ends in a curved claw and bears numerous comb-like arranged slender spinules on the posterior margin. The propodus is 4.5 to 5 times as long as the dactylus; its posterior margin bears some 15 to 17 spinules, the distal of which are the most conspicuous. The carpus is slightly more than half as long as the propodus and bears a strong distal spine on the outer surface. The merus is somewhat shorter than the propodus and is provided with 3 strong spines in the distal half of the outer surface near the posterior margin.

The endopod of the first pleopod of the male is about triangular in outline and possesses a well developed appendix interna, which reaches beyond the top of the endopod. In the second pleopod of the male the appendix masculina is about twice as long as the appendix interna; it bears several strong spines on its inner and distal margins. The diaeresis of the uropodal exopod bears 19 to 23 spinules.

So far *Caridina japonica* was known only from Japan (from Sagami Bay south) and Okinawa. The present find of the species in four different localities in Madagascar therefore comes as a surprise. A comparison of the Madagascar material with the good description and figures given by Kubo (1938, p. 89, figs. 17-19) of Japanese specimens failed to produce any difference that might be considered of specific or subspecific value. Unfortunately no Japanese material of the species is present in the Leiden Museum.

The species is closest, among Madagascar representatives of the genus, to *Caridina typus*, from which it may at once be distinguished by the spinulation of the dorsal margin of the rostrum. Also the shape of the dactyli of the third and fourth pereopods is quite characteristic.

#### *Caridina nilotica* (P. Roux) (fig. 5)

*Pelias niloticus* P. Roux, 1833, p. 73, pl. 7, fig. 1.

*Caridina Wycki paucipara* Bouvier, 1904, p. 130; Bouvier, 1905, p. 79.

*Caridina wyckii* Lenz, 1905, p. 385.

*Caridina nilotica gracilipes* Lenz, 1910, p. 568.

*Caridina Voeltzkowi* Lenz, 1910, p. 569.

*Caridina nilotica typica* Bouvier, 1925, p. 146; J. Roux, 1929, pp. 298, 318.

*Caridina nilotica paucipara* Bouvier, 1925, p. 153, figs. 316-318; J. Roux, 1929, pp. 300, 318.

*Caridina nilotica* Holthuis, 1956, p. 64.

#### MADAGASCAR INSTITUTE:

— Ambila, Zanavorony Lake, about 150 km S of Tongobory, SW Madagascar; April 1951; R. Paullan. — 1 specimen.

- Ankavandra, Manambolo River, W Madagascar; July 1949; R. Paulian. — 4 specimens.
- Namoroka, WSW of Kinkony Lake; rivulet; September 1952; R. Paulian. — 12 specimens.
- Ambohinorija Pool, Namoroka; September 1952; R. Paulian. — 7 specimens.
- Ambovomby cave, Namoroka; September 1952; R. Paulian. — 1 specimen.
- Ampijoroa, Tsaramandroso, 30 km SE of Marovoay. — 4 specimens (1 ovigerous).
- Marovoay plain; October 1949; R. Paulian. — 6 specimens (2 ovigerous).
- Antsohlly; October 1949; R. Paulian. — 11 specimens (4 ovigerous).
- Beangony at the foot of Tsaratanaro Mt., NE of Maromandia; October 1949; R. Paulian. — 5 specimens.
- Sambirano, Miziloko, near Ambanja opposite Nosy Bé; July 1948; J. Millot. — 3 specimens.
- Mananja River, Ambilobé, N Madagascar; April 1951; R. Paulian. — 32 specimens (3 ovigerous).
- Ambodivoangy, near Maroantsetra, Antongil Bay, NE Madagascar; fresh water; 1946; J. Millot. — 4 specimens (1 ovigerous).
- Alaotra Lake; June 1951; P. A. Robinson. — 7 specimens.
- Highway from Ambalarondro to Anjahamanana near Brickaville, E Madagascar; September 1954; P. A. Robinson. — 7 specimens (1 ovigerous).
- Ranomatana near highway to Tamatave; March 1954; P. A. Robinson. — 2 specimens (1 ovigerous).
- Fort-Dauphin, SE Madagascar; August 1948; J. Millot. — 13 specimens (1 ovigerous).
- Bevia Forest, Behara, S of Tranomaro, SE Madagascar; August 1948; J. Millot. — 8 specimens.
- Androy, Tranomaro; 11-15 August 1948; R. Paulian. — 2 specimens.

## AUSTRIAN MADAGASCAR EXPEDITION :

- Lily River, an affluent from Itasy Lake, W of Tananarive; sandy shore; 18 September 1958; F.M. 228. — 6 specimens.
- Kinkony Lake, SW of Majunga, near west coast; 19 June 1958; F.M. 246. — 1 specimen.
- Shore of Kinkony Lake; 19 June 1959; F.M. 245. — 9 specimens.
- Bemanondro Rivulet, Nosy Bé; 15 August 1958; F.M. 143. — 1 specimen.
- Andranobe Rivulet, Nosy Bé; 17 August 1958; F.M. 149. — 33 specimens.
- Fascène Rivulet, Nosy Bé; 18 August 1958; F.M. 154. — 7 juveniles.
- Djabababe Rivulet, Nosy Bé; 20 August 1958; F.M. 163. — 2 specimens.
- Djabala Rivulet, Nosy Bé; 22 August 1958; F.M. 172. — 5 juveniles.
- Isaka Rivulet, about 35 km NW of Fort-Dauphin, SE Madagascar; 9 September 1958; F.M. 210. — 3 specimens (1 ovigerous).
- Rivulet emptying in Anosy Lake, between Amboasary and Fort-Dauphin; 7 September 1958; F.M. 200. — 4 specimens (1 ovigerous).

## MUSEUM LEIDEN :

- Rivulet in Mitsinjo forest, Mitsinjo district, Majunga province, NW Madagascar; 25 September 1960; native name « tsitsika »; Y. Therezien no. 23. — 4 specimens.
- Northern Madagascar; coll. Waterlot, don. Zoological Museum Munich. — 5 specimens (1 ovigerous).
- Antsakomanondro rivulet 13 km N of Ambanja on the highway to Ambilobé, Ambanja district, Diégo-Suarez province, N. Madagascar; 4 May 1959; Y. Therezien no. 39, récolte no. 111. — 4 specimens.
- Beamalona River, Diégo-Suarez district, Diégo-Suarez province; 28 April 1959; Y. Therezien no. 41, récolte no. 106. — 1 specimen.
- River at km. 107 of the highway from Diégo-Suarez to Ambilobé, Diégo-Suarez district, Diégo-Suarez province; 29 April 1959; Y. Therezien no. 42, récolte no. 108. — 2 specimens.
- Andrarony River, Antalaha district, Diégo-Suarez province; 8 km from the mouth of the river; 7 February 1962; native name « patsa » or « pitsikorana »; Y. Therezien no. 32. — 2 ovigerous females.
- Lily-Ampefy-Itasy, Soavinandriana district, Tananarive province, Central Madagascar; 18 September 1958; Y. Therezien no. 46, récolte no. 51. — 1 damaged specimen.
- River near Anosy Lake, between Amboasary du Sud and Fort-Dauphin, Amboasary du Sud district, Tuléar province, SE Madagascar; 7 September 1958; Y. Therezien no. 37, récolte no. 35. — 2 specimens.

The specimens measure 14 to 30 mm. The ovigerous females are 17 to 30 mm long.



The rostrum is very long, slender and curved upward at the tip. It usually reaches distinctly beyond the antennal scale and has the tip bi- or trifid. There is a distal unarmed portion on the dorsal margin behind the single or double subapical tooth. The proximal part of the upper border of the rostrum bears 13 to 27 teeth 2 or 3 of which are placed behind the orbit. All teeth are placed quite close together. The lower margin bears 6 to 22 teeth. The upper teeth articulate with the rostrum, the lower do not. The lower orbital angle is very distinct and separated from the antennal spine by a good distance. The pterygostomial angle is rounded.

The dorsal surface of the telson bears 2 to 5, usually 3 or 4 pairs of spinules. The posterior margin of the telson is rounded and shows no median tooth. The outer pair of posterior spines is very short, being less than 1/4 of the length of the well developed lateral pair. There are 4 to 8 intermediate spines, which are undivided and distinctly shorter than the laterals.

The stylocerite is slender and pointed, it reaches beyond the middle of the basal segment of the antennular peduncle but distinctly fails to reach the end of the segment. The anterolateral tooth of this segment is sharply pointed, it fails to reach the middle of the second segment. The spine near the base of the scaphocerite is well developed and sharp.

The branchial formula is normal; epipods are present at the bases of the first 4 pereopods.

The carpus of the first leg is longer than the merus; it is usually more, sometimes somewhat less, than twice as long as high. It is shorter than the chela. The carpus of the second leg is longer than the chela, it is 3 to 6 times as long as high. In the third leg the dactylus bears 5 or 6 posterior teeth additional to the distal claw; the propodus is 4 to 4.5 times as long as the dactylus. The propodus of the fifth legs is 3.5 to 4.5 times as long as the dactylus.

The endopod of the first pleopod of the male is provided with a well developed appendix interna. The exopod of the uropod bears 7 to 13 spinules on the diaeresis. The preanal carina is blunt without a spine.

The eggs are rather voluminous, they measure  $0.5-0.7 \times 0.7-1.2$  mm.

*Caridina nilotica*, if all records in the literature are correct, is a very widely distributed species, its range extending from eastern Africa (Egypte to S. Africa) to Japan and Polynesia. A thorough study of the *nilotica* complex is highly necessary and until then nothing positive about the area of the species can be said. Type locality is the Nile river near Cairo. The records from Madagascar found in the literature are the following: Madagascar (BOUVIER, 1904, 1905, 1925), tributary of the Onilahy River near Kofotsy at 50 km from the coast, SW Madagascar (BOUVIER, 1904, 1925, name of the river erroneously spelled Anilabry), Itasy Lake, Central West Madagascar (LENZ, 1910; BOUVIER, 1925), Tananarive (BOUVIER, 1904, 1925), inundation swamp of the Betsiboka River (J. ROUX, 1929), Majunga (LENZ, 1905), Namoroka and Kapiloza Rivers, Ambongo, Majunga province (J. ROUX, 1929), Ambovononby Cave near Namoroka, Majunga province (HOLTHUIS, 1956), neighbourhood of Manarasandry, Majunga province (J. ROUX, 1929), Alaotra Lake, E Madagascar (LENZ, 1910; BOUVIER, 1925, who gave the locality under its correct name and under the incorrect spellings Alasha, Maotra and Maotva), Imerimandrosa on Alaotra Lake (BOU-

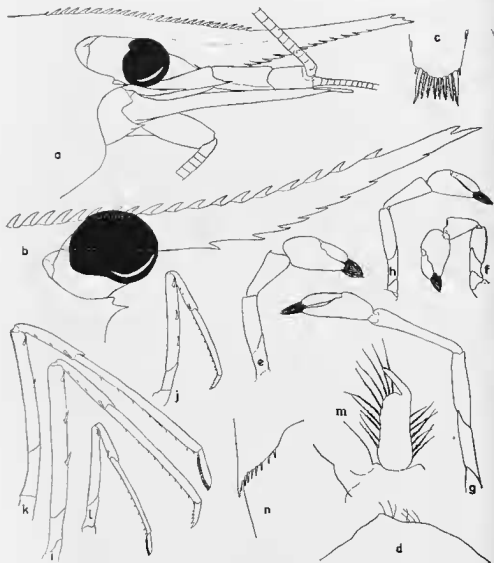


FIG. 5. — *Caridina nilotica* (P. Roux). a, b, anterior part of body in lateral view; c, tip of telson; d, pre-anal carina; e, f, first pereopod; g, h, second pereopod; i, j, third pereopod; k, l, fifth pereopod; m, endopod of first pleopod of male; n, outer part of diaeresis. a, e-l,  $\times 15$ ; b-d, n,  $\times 30$ ; m,  $\times 50$ . a, c-e, g, i, k, m, n, specimen from Mananjeba River; b, specimen from Lily River; f, h, j, l, specimen from Andranobe rivulet.

VIER, 1925; J. ROUX, 1929), Ambatonharanana near Ampasimpotsy, mountains leading to Mangoro Terrace (BOUVIER, 1925, locality spelled incorrectly Ambatoubavara), Ankobo, Manambovo River, N of Tamatave (BOUVIER, 1925, name of river spelled incorrectly Manambowo), Canal des Pangalanes, region of Ambila, between Tamatave and Brickaville (J. ROUX,

1929), Andovoranto, Lagoan district, S of Tamatave (BOUVIER, 1925), Vinanybe Lake, Fort-Dauphin, SE Madagascar (BOUVIER, 1904, 1925, name erroneously spelled as la Vinangbe), Imanombo River, S Madagascar (BOUVIER, 1904); the localities Ivolo River (BOUVIER, 1904, 1925) and Irangy River (J. ROUX, 1929) are unknown to me, while also Dr. PAULIAN, who provided me with the exact position of many of the Madagascar localities, informed me that he was unable to locate them.

BOUVIER (1925) in his very useful monograph of the Atyidae recognized a large number of "varieties" of *Caridina nilotica*. As shown already by various authors, some these varieties are good species, while others cannot be kept separate. As GORDON (1930) showed, part of BOUVIER's specimens of *Caridina nilotica* var. *typica* do not belong to *C. nilotica* at all, but are *C. africana* Kingsley. BOUVIER (1925) and J. ROUX (1929) mentioned the following varieties of *C. nilotica* for Madagascar: var. *typica*, var. *stylirostris*, var. *xiphias*, var. *gracilipes*, var. *paucipara*, var. *brachydactyla*, and var. *brevidactyla*. After studying the present material I have come to the conclusion that vars. *xiphias* and *stylirostris* are no *C. nilotica* and even belong in a different section of the genus (see under *C. xiphias*). The specimens brought by BOUVIER and J. ROUX to vars. *brachydactyla* and *brevidactyla* I consider as specifically distinct from *C. nilotica* and have assigned them here more or less provisionally to *C. longirostris*. Part of the specimens assigned by previous authors to var. *gracilipes* seem also to belong to *C. longirostris* while others, judging by the description, might be what I have named here *C. nilotica*. As to vars. *typica* and *paucipara*, I found it impossible to distinguish between these two in my Madagascar material. BOUVIER (1925, p. 153) already remarked that the var. *paucipara* « passe insensiblement à la forme *typica*, de sorte qu'il est souvent très difficile, sinon impossible, d'attribuer certains individus à l'une ou l'autre des deux variétés », an opinion which was fully shared by J. ROUX (1929, p. 300). Without giving any definite opinion about the status of the true *Caridina nilotica* *paucipara* De Man from Natal, basing myself on the Madagascar material I can only come to the conclusion that we have to do here with a single species of which I am unable to distinguish any subdivisions.

The status of *Caridina nilotica* and its various forms needs a careful revision based on extensive collections from all over the range of the species. The fact that BOUVIER's (1925) species is a heterogeneous assemblage is already clear from the fact that it is mentioned in no less than 6 places in his key to the species of *Caridina*. A most useful contribution to our knowledge of the status of the typical *Caridina nilotica* was given by GORDON (1930) who examined material from the type area and compared it with specimens from farther south in eastern Africa. GORDON's material agrees quite well with ours except for two characters, namely (1) that of the posterior margin of the telson which in GORDON's specimens is relatively narrower and ends in a median tooth (except for 4 aberrant specimens), while (2) the eggs in her material are slightly smaller being  $0.40-0.52 \times 0.66-0.78$  mm in Egyptian specimens, and  $0.31-0.45 \times 0.54-0.73$  mm in other specimens from the Nile valley. As the character of the rounded tip of the telson is not altogether constant in my material, while the difference in the size of the eggs is so small, I thought it best to assign my material, for the time being at least, to the typical *Caridina nilotica*. An examination of more

material may prove me wrong here. The number of intermediate spines on the posterior margin of the telson of Madagascar specimens agrees best with that found by GORDON in material from the southern part of the East African range of the species.

BOUVIER (1904, 1905, 1925) gave rather few details of the Madagascar specimens which he assigned to *C. nilotica typica* and *C. n. paucipara*. The dimensions of the eggs is given by him (BOUVIER, 1905, p. 80) as  $0.5 \times 0.65-0.9$  mm, which agrees very well with what I found in my material. Part of the specimens brought by BOUVIER in 1904 and 1905 to *C. n. paucipara* are referred by him to *C. n. typica* in 1925. In his 1925 book he did figure a specimen (*C. n. paucipara*) from Madagascar (fig. 316-318).

LENZ (1905) gave too few details of his specimens to make certain whether they belong to the present or to the next species. The specimens which the same author (LENZ 1910, p. 568, 569) assigned to *C. n. gracilipes* and *C. Voeltzkowi* were identified by J. Roux (1929, p. 312), who evidently examined them, as *C. n. paucipara*.

### *Caridina longirostris* H. Milne Edwards (fig. 6)

*Caridina longirostris* H. Milne Edwards, 1837, p. 363.

*Caridina Wyckii gracilipes* Coutière, 1900, p. 1267.

*Caridina nilotica brachydactyla* Lenz, 1910, p. 568; Bouvier, 1925, p. 155.

*Caridina nilotica gracilipes* p.p. Bouvier, 1925, p. 152.

*Caridina nilotica brevidactyla* J. Roux, 1929, p. 303.

#### MADAGASCAR INSTITUTE :

- St. Augustin, SW Madagascar; 4 April 1953; P. A. Robinson. — 2 specimens (1 ovigerous).
- Agricultural Station Bas-Mangoky on the southern shore of the Mangoky River at 60 km from the sea; March 1955; P. A. Robinson. — 3 specimens (2 ovigerous).
- River N of Majunga; December 1951; R. Paulian. — 1 specimen.
- Antsohihy, NW Madagascar; stagnant water; October 1949; R. Paulian. — 3 specimens.
- Ranomafana near highway to Tamatave; March 1954; P. A. Robinson. — 4 specimens (3 ovigerous).

#### AUSTRIAN MADAGASCAR EXPEDITION :

- Djabala Rivulet, Nosy Bé, NW Madagascar; 22 August 1958; F. M. 171. — 2 specimens (1 ovigerous).
- Androadrotra Rivulet, Nosy Bé; 23 August 1958; F.M. 175. — 20 specimens.
- Small lake near Mangatsa, Majunga district, NW Madagascar; 16 January 1959; F.M. 240. — 2 specimens (1 ovigerous).
- Mandromodromotra Rivulet near Mahialambo, about 20 km N of Fort-Dauphin; 11 September 1958; F.M. 217. — 5 specimens.

#### MUSEUM LEIDEN :

- Ampapamena near Analalava, Majunga province; Waterlot coll.; don. Museum Munich. — 2 specimens.
- Analalava, small brook near its mouth; Waterlot coll.; don. Museum Munich. — 10 specimens (3 ovigerous).
- Antsirabe near Anorotsangana, Amboanga district, Nosy province; Waterlot coll.; don. Museum Munich. — 5 specimens (1 ovigerous).
- Ambalonjanahary near Diégo-Suarez, N Madagascar; brook; Waterlot coll.; don. Mus. Munich. — 2 specimens.
- Near Ambahoahé, Simianona River, N of Soanierana, E Madagascar; December 1938; H. J. Lam & A.D.J. Meeuse. — 1 ovigerous female.

- Maningory, Tamatave province, E Madagascar; 1927; G. Petit; don. Mus. Munich. — 1 specimen.  
 — Mandromodromotra Rivulet, Piste Elandy, Fort-Dauphin district, Tuléar province, SE Madagascar; 11 September 1958; Y. Therezien no. 36, récolte no. 46. — 1 specimen.

The specimens are 13 to 35 mm long, the ovigerous females measure 25 to 35 mm.

The rostrum usually is very long and slender, reaching distinctly beyond the scaphocerite; in a few specimens it is slightly shorter than the scaphocerite. The tip is curved upward, and bifid by the presence of a subapical tooth. There is a distinct unarmed portion in the distal part of the upper margin of the rostrum behind the subapical tooth. The upper border bears 13 to 23 proximal teeth, 2 or 3 of which are placed behind the orbit. The lower margin bears 5 to 22 teeth. The lower orbital angle is well developed, and distinctly separated from the strong antennal spine. The pterygostomial angle is rounded.

The upper surface of the telson bears 2 to 4, usually 3 or 4, pairs of spinules. The posterior margin of the telson is rather narrow and ends in a sharply pointed median tooth. The outer spines of this margin are less than  $\frac{1}{3}$  of the length of the laterals. There are 2 to 6 intermediate spines, which are not divided and are shorter than the laterals.

The eyes, antennulae and antennae show no difference from those of *C. nilotica*.

The branchial formula is as in the previous species.

The carpus of the first pereopod is longer than the merus and 2 to 3 times as long as wide. The carpus of the second pereopod is more than 5 times as long as wide. The propodus of the third leg is 5 to 6 times as long as the dactylus, that of the fifth leg measures 4.5 to more than 5 times the length of the dactylus.

The endopod of the first pleopod of the male has a well developed appendix interna, which is already quite distinct in juvenile specimens. The exopod of the uropod shows 8 to 15 spinules on the diaeresis.

The preanal carina ends in a strong posteriorly directed sharp spine.

The eggs are numerous and small and measure  $0.2-0.25 \times 0.3-0.4$  mm.

The Madagascar material brought to the present species shows a very close resemblance to *C. nilotica* but differs in a number of characters, the most important of which are (1) the eggs are much smaller and more numerous, (2) the preanal carina bears a strong spine, (3) the posterior margin of the telson ends in a median point, (4) the dactyli of the last three pereopods are relatively shorter.

Though I am convinced that the two forms indicated here as *C. nilotica* and *C. longirostris* are distinct species, I am by no means certain that the names given here are used correctly. Judging by BOUVIER's (1925) description of the types of *Caridina longirostris* the present form agrees closely with it and for that reason it is provisionally assigned to this, one of the longest known species of the genus. It will be up to future investigations to define the status of the various species of *Caridina*, including that of the present one.

COUTIÈRE (1900) did not give any details of the Madagascar specimens which he identified as *Caridina wyckii gracilipes*, but BOUVIER (1925, p. 153)

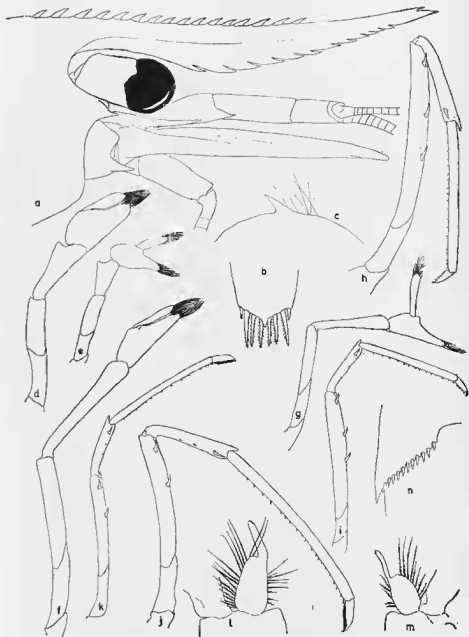


FIG. 6. — *Caridina longirostris* H. Milne Edwards. a, anterior part of body in lateral view; b, tip of telson; c, pre-anal carina; d, e, first pereopod; f, g, second pereopod; h, i, third pereopod; j, k, fifth pereopod; l, m, endopod of first pereopod of male; n, outer part of diaeresis. a, d-k,  $\times 13$ ; b,  $\times 26$ ; c,  $\times 52$ ; l, m,  $\times 40$ . a-d, f, h, j, specimen from Ranomafana; e, g, i, k, specimen from Analalava; l, m, specimen from Bas-Mangoky.

under *C. nilotica gracilipes* mentioned « quelques spécimens portant l'indication H.C. 19 (3 paires d'épines dorsales au telson, œufs de 0.40) », which may have been COUTIÈRE's specimens, and which, judging by the size of the eggs, belong in the present species.

LENZ's (1910, p. 569) specimens indicated with the name *Caridina nilotica brachydactyla* evidently also belong here in view of the fact that one of the characters of DE MAN's form is that the dactyli of the last three pereopods are short. In my opinion *Caridina brachydactyla* is a distinct species, characterized among other things by the strong development of the distal spine on the posterior margin of the last three pereopods. No Madagascar specimens of that species have been seen by me, the Madagascar specimens assigned to that form by previous authors in all probability all belong to *C. longirostris*. J. ROUX's (1929) account of his Madagascar *C. nilotica brev dactyla* also checks well with our specimens. Therefore all are provisionally identified with *Caridina longirostris*.

Due to the confusion existing in the systematics of the *nilotica* group of *Caridina* it is impossible to give the exact range of the present species. It was originally described from Algeria, but authors like BOUVIER (1925, p. 149-151) have made it very probably that this locality indication is erroneous. It is possible that the species has a rather wide distribution in the Indo-West Pacific area. The previous Madagascar records are the following : Madagascar (COUTIÈRE, 1900), Onilahy River, SW Madagascar (BOUVIER, 1925), Maroamafona, Tuléar Province (BOUVIER, 1925), Kinkony Lake, W Madagascar (LENZ, 1910, spelled as Kikuni), Ivoloïna River near Tamatave, E Madagascar (J. ROUX, 1929), and the locality Andamagassa (BOUVIER, 1925), the situation of which is unknown to Dr. PAULIAN and myself, and probably is incorrectly spelled.

### *Caridina gracilirostris* De Man (fig. 7)

*Caridina gracilirostris* De Man, 1892, p. 399, pl. 25, fig. 31 ; J. Roux, 1929, p. 296.

#### MADAGASCAR INSTITUTE :

— Agricultural Station Bas-Mangoky on the southern shore of the Mangoky River at 60 km from the sea, SW Madagascar ; March 1955 ; P.A. Robinson. — 12 specimens (4 ovigerous).

— Marovoay plains, NW Madagascar ; October 1949 ; R. Paulian. — 3 specimens (2 ovigerous).

#### MUSEUM LEIDEN :

— Antstrabe near Anorotsangana, Amboanga district, Nosy province, NW Madagascar ; Waterlot coll., Museum Munich don. — 3 specimens.

— Ambanja Lake, Ambato-Boeni district, Majunga province, NW Madagascar ; 3 November 1969 ; native names « tsitsika » and « tsivaky » ; Y. Therezien nos. 27 and 30. — 21 specimens (6 ovigerous).

The specimens measure 21 to 37 mm ; the ovigerous females are 26 to 35 mm long.

The rostrum is very long and slender, reaching distinctly beyond the scaphocerite, often with more than half its length. The tip of the rostrum

is curved upwards, it is bifid to quadrifid by the presence of one to three subapical teeth. A considerable portion of the dorsal margin behind the subapical tooth is entire. In the proximal part the dorsal margin bears 5 to 13 teeth of which at most 1 is placed behind the orbit. The teeth are rather widely separated. The lower margin of the rostrum is serrate and bears 28 to 33 teeth. The lower orbital angle is very distinct and rounded. The antennal spine is strong, and sharply pointed; it is placed some distance below the orbital angle. The pterygostomial angle is not produced but about rectangularly rounded.

The telson bears dorsally 3 or 4 pairs of spinules. Its posterior margin is rather narrow and ends in a distinct median point. The outer spines are about half as long as the laterals. The intermediate spines are absent or represented by a single pair.

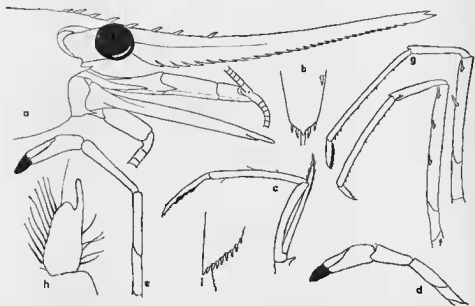


FIG. 7. — *Caridina gracilirostris* De Man. *a*, anterior part of body in lateral view; *b*, tip of telson; *c*, third maxilliped; *d*, first pereopod; *e*, second pereopod; *f*, third pereopod; *g*, fifth pereopod; *h*, endopod of first pleopod of male; *i*, outer part of diaeresis. *a*, *c-g*,  $\times 13$ ; *b*, *i*,  $\times 26$ ; *h*,  $\times 52$ . *a-g*, *i*, specimen from Marovoay plains; *h*, specimen from Bas-Mangoky.

The stylocerite is slender and pointed, it reaches beyond the middle of the basal segment of the antennular peduncle but fails (sometimes by not very much) to attain the end. The anterolateral tooth of the segment is well developed but fails by far to reach the middle of the second segment of the peduncle. At the base of the scaphocerite the antennal peduncle shows a well developed sharp spine.

Epipodites are present at the base of the first four pereopods.

The carpus of the first cheliped is longer than the merus and about 2 to 2.5 times as long as wide. The carpus of the second leg is more than 5



times as long as wide. In the third pereopod the propodus is more than 4 times as long as the dactylus, while in the fifth pereopod the propodus is 3.5 to 4 times the length of the dactylus.

The endopod of the first pleopod of the male bears a distinct appendix interna. The diaeresis of the uropodal exopod bears 8 to 12 spinules. The preanal carina ends in a distinct posteriorly directed spine.

The eggs measure  $0.3-0.4 \times 0.5-0.6$  mm.

In many respects the present species is extremely close to *C. longirostris*, it may immediately be recognized however by the small number of dorsal teeth of the rostrum, which are very widely spaced. This feature is so striking that it serves as an easy means to identify the species.

The present specimens agree well with the descriptions given of the species in the literature.

The species is known from a large part of the Indo-West Pacific area (Madagascar and India to Malaysia and Palau). The only previous record of the species from Madagascar is that by J. Roux (1929) who reported it from the Maintimazo River at Bemazaka, Majunga province, N.W. Madagascar.

#### *Caridina serratiostris* De Man (fig. 8)

*Caridina serratiostris* De Man, 1892, p. 382, pl. 23, fig. 28.

##### MADAGASCAR INSTITUTE :

— Antsohiby, NW Madagascar; stagnant water; October 1949; R. Paulian. — 1 specimen.

##### AUSTRIAN MADAGASCAR EXPEDITION :

— Small lake near Mangatsa, Majunga district, NW Madagascar; 16 January 1953; F.M. 240. — 3 specimens.

##### MUSEUM LEIDEN :

— Antsirabe near Anorotsangana, Amboanga district, Nosy province, NW Madagascar; leg. M. Waterlot; don. Mus. Munich. — 2 specimens (1 ovigerous).

The specimens are 9 to 20 mm long, the ovigerous female measuring 20 mm.

The rostrum is straight, it reaches slightly beyond the end of the antennular peduncle. The upper margin is evenly serrated bearing 19 to 26 teeth, 6 to 8 of which are placed behind the orbit. The lower margin bears 6 to 8 teeth, the last being removed some distance from the tip of the rostrum.

The antennal spine is distinct, it is placed some distance below the rounded lower orbital angle. The pterygostomian angle is rounded, not produced.

The telson bears 4 or 5 pairs of spines on the dorsal surface. The posterior margin is rounded with a subterminal median spinule. The lateral spines of the posterior margin are more than 4 times longer than the outer. The outer pair of intermediate spines is shorter than the lateral and simple, between these there are 4 (in juveniles) to 8 (in old specimens) long spines, which are distinctly longer than the laterals and are divided in two by a kind of chitinous plug.

The eyes are well developed with a rounded pigmented cornea. The stylocerite is very long, reaching far beyond the anterolateral angle of the basal segment of the antennular peduncle and reaching to or even beyond the middle of the second segment. This second segment is exceptionally long and slender. The stylocerite is relatively longer in adults than in juveniles but always reaches beyond the basal segment. The scaphocerite ends in a strong tooth, which is hardly overreached by the lamella. There is a strong and slender outer spine on the antennal peduncle near the base of the scaphocerite.

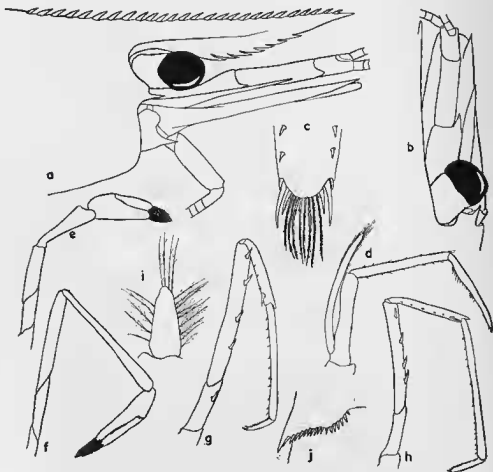


FIG. 8. — *Caridina serratiostris* De Man. a, anterior part of body in lateral view; b, eye, antennula and antenna, in dorsal view; c, tip of telson; d, third maxilliped; e, first pereopod; f, second pereopod; g, third pereopod; h, fifth pereopod; i, endopod of first pleopod of male; j, outer part of diaeresis. a, b, d-h,  $\times 16$ ; e, f,  $\times 32$ ; i,  $\times 65$ . a-h, j, specimen from Antsirabe; i, specimen from Antsohihy.

Epipods are present on the bases of the first four pereopods.

The carpus of the first pereopod is longer than the merus, being 3.5 times as long as wide and about as long as the chela. In the second pereopod the carpus is far longer than the chela and about 10 times as long as wide. The fingers are remarkably long and slender. The dactylus of the third pereopod is relatively very slender, it ends in two teeth and bears about 9 additional spinules on the posterior margin. The propodus is about  $3\frac{1}{2}$  times as long as the dactylus. The dactylus of the fifth leg is also very slender, bearing about 16 spinules on the posterior margin behind the distal pair. Here too the propodus is about 3.5 times as long as the dactylus.

The preanal carina ends in a strong posteriorly directed spine.

The uropodal exopod bears 15 to 18 spinules on the diaeresis.

The eggs are numerous and small, measuring  $0.3-0.35 \times 0.5$  mm.

The species is very characteristic and immediately recognisable by the large number of dorsal rostral teeth behind the orbit and by the long stylocerite.

It was originally described from the Lesser Sunda Islands, Indonesia, and is now known to inhabit an area extending from the Seychelles and Mauritius to Okinawa, Polynesia, and N.E. Australia. It is here reported for the first time from Madagascar.

#### *Caridina petiti* J. Roux

*Caridina petiti* J. Roux, 1929, p. 314, figs. 13-15; Decary, 1950, p. 167.

No material of this species has been examined by me. So far it is only known from the type material. For the description I refer to J. Roux's (1929) account.

The species shows closest resemblance to *C. calmani* with which it agrees in most respects. The most conspicuous difference being the full dentition of the rostrum in *C. petiti*. It is possible that *C. petiti* should be considered to be a subspecies of *C. calmani*.

The type-locality of J. Roux's species is eastern lagoons near Ambila (between Brickaville and Tamatave), eastern Madagascar.

#### *Caridina calmani* Bouvier (fig. 9)

*Caridina Calmani* Bouvier, 1919, p. 334; Bouvier, 1925, p. 253, figs. 572-599.

*Caridina Bouvieri* J. Roux, 1929, p. 312, figs. 7-12.

##### MADAGASCAR INSTITUTE :

- Highway near Anosibé, SE of Tananarive, E Madagascar; running water; January 1951; R. Paulian. — 20 specimens (2 ovigerous).
- Forest near Anosibé; January 1951; R. Paulian. — 4 specimens (2 ovigerous).
- Near Forestry Station Manjakatampo, Ambahona, Ankaratra massif, above Ambatolampy, 70 km S of Tananarive; brooklets and pools; altitude 1700 m; 4 July 1956. — 4 specimens.

## AUSTRIAN MADAGASCAR EXPEDITION :

- Périnet, E Madagascar (halfway between Tananarive and the coast); small brook emptying in Lac Vert; 28 July 1958; F.M. 109. — 2 specimens (1 ovigerous).
- Périnet; small brook running from Lac Rouge; 23 July 1958; F.M. 111. — 5 specimens.
- Périnet; small brook near Lac Rouge; 23 July 1958; F.M. 112. — 7 specimens.
- Périnet; source in virgin forest; 28 July 1958; F.M. 113. — 32 specimens.
- Périnet; source in swampy part of virgin forest; 30 July 1958; F.M. 117. — 14 specimens.
- Périnet; source; 30 July 1958; F.M. 118. — 28 specimens (2 ovigerous).
- Périnet; source in virgin forest; 31 July 1958; F.M. 120. — 2 specimens (1 ovigerous).

The specimens are 6 to 20 mm long. The ovigerous females measure 14 to 16 mm.

The rostrum is short, it reaches to the base or to the end of the second segment of the antennular peduncle, sometimes it is shorter than that, rarely longer. As a rule the rostrum is rather high, but sometimes quite shallow. The upper margin bears no teeth, rarely 1 dorsal tooth is found and one specimen even showed 7 teeth. The lower margin bears 0 to 3 teeth.

The antennal spine is placed the lower below orbital angle. Sometimes it is well developed and sharply pointed, sometimes it is just a blunt angle. The lower orbital angle is usually quite inconspicuous and often folded inwards and thereby obscured from view. The pterygostomial angle is rectangularly or more acutely rounded, it is as a rule distinctly forwards produced, sometimes very much so.

The dorsal surface of the telson bears 3 to 5 pairs of spinules. The posterior margin of the telson is rounded without a median point. The lateral spines are more than 4 times longer than the outer. The intermediate spines are 4 to 14 in number, the outer of them are shorter, the inner longer than the lateral spines, they are divided in two by a chitin plug.

The eyes are well developed. The antennula is robust with short segments. The stylocerite is rather blunt, reaching beyond the middle of the basal segment, but failing to reach the end of it. The anterolateral angle of the segment is produced into a tooth, which does not attain the middle of the second segment. The antennal peduncle shows a distinct tooth near the base of the scaphocerite. This tooth may be broad and blunt or rather slender. The final tooth of the scaphocerite is broad.

Epipods are found at the bases of the first four pereopods.

The carpus of the first pereopod is slender, it is longer than the merus and about as long as the chela; it is 2.5 to 3 times as long as wide. The carpus of the second pereopod is still much more elongate, being 6 to 7 times as long as wide and much longer than either merus or chela. The propodus of the third leg is about 3 to 4 times as long as the dactylus. The propodus of the fifth leg is also about 3 to 4 times as long as the dactylus. The endopod of the first pleopod of the male is without appendix interna.

The preanal carina is blunt without a spine.

The diaeresis of the uropodal exopod bears 12 to 20 spinules.

The eggs are large, they measure 0.6-0.7 × 0.9-1.1 mm.

The species sofar is only known from central eastern Madagascar. The type locality is Ambatonharanana near Ampasimpotsy, in mountains leading to the Mangoro Terrace near lake Alaotra (erroneously indicated by BOUVIER as Ambatoubavara). The range seems to be rather restricted.

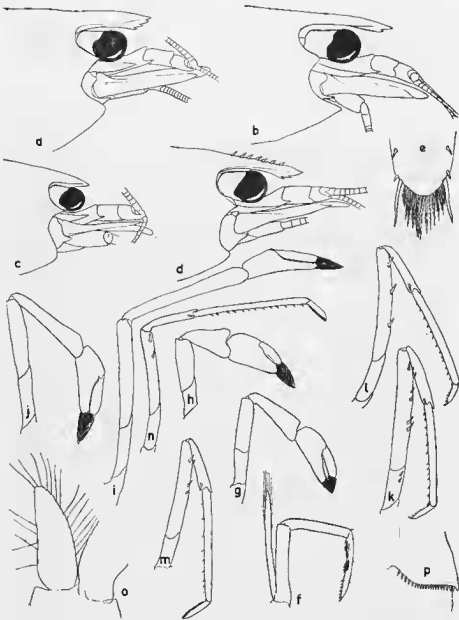


FIG. 9. — *Coridina calmani* Bouvier. *a-d*, anterior part of body in lateral view; *e*, tip of telson; *f*, third maxilliped; *g, h*, first pereopod; *i, j*, second pereopod; *k, l*, third pereopod; *m, n*, fifth pereopod; *o*, endopod of first pleopod of male; *p*, outer part of diaeresis. *a-d, f-n*,  $\times 16$ ; *e, p*,  $\times 32$ ; *o*,  $\times 65$ . *a, e-g, i, k, m, o, p*, specimen from Périnet, F.M. 118; *b, h, j, l, n*, specimen from highway near Anosibé; *c, d*, specimen from Périnet, F.M. 120.

Examination of topotypic material of *Caridina bouvieri* J. Roux convinced me that that species cannot be separated from *C. calmani*, and represents at most a local variant characterized i.a. by a low number of spinules on the diaeresis.

#### ***Caridina angulata* Bouvier**

*Caridina angulata* Bouvier, 1905, pp. 75, 84, fig. 8 ; Lenz, 1910, p. 570 ; Bouvier, 1912, p. 919 ; Bouvier, 1913, p. 465 ; Bouvier, 1925, p. 240, figs. 555-561.

I have seen no material of this species. It has been reported from an area roughly SW of that of *C. calmani*. An examination of a more extensive material from both areas may prove that the two species actually are only subspecies ; in that case the name *angulata* has priority. The type locality of *C. angulata* is Ranofotsy River near Fianarantsoa, at the plateaux between Ihosy and Tananarive. LENZ (1910) reported the species from Itasy Lake.

#### ***Caridina edulis* Bouvier**

*Caridina edulis* Bouvier, 1904, p. 135 ; Bouvier, 1905, p. 91, fig. 13 ; Bouvier, 1912a, p. 919 ; Bouvier, 1913, p. 465 ; Bouvier, 1925, p. 208, figs. 458-463.

This species of which no material has been examined by me, seems to be characterized by the dactyli of the third legs, which according to BOUVIER (1925, p. 210, fig. 460) have 15 to 17 teeth on the posterior margin, a number which is more than double that of the related Madagascar species.

The types are known to come from Madagascar, but no more precise locality indications are available. BOUVIER (1904) brought also some specimens from Anantsahalankely to this species.

#### ***Caridina isaloensis isaloensis* Coutière (fig. 10)**

*Caridina typus isaloensis* Coutière, 1899, p. 383.

*Caridina typus Isaloensis* Coutière, 1900, p. 1267.

*Caridina isaloensis* Bouvier, 1904, p. 135 ; Bouvier, 1905, p. 90, fig. 12 ; Bouvier, 1912a, p. 919 ; Bouvier, 1913, p. 465 ; Bouvier, 1925, p. 195, figs. 412-415 ; J. Roux, 1929, p. 310 ; Decary, 1950, p. 167.

*Caridina madagascariensis* Bouvier, 1904, p. 134 ; Bouvier, 1905, p. 89 ; Bouvier, 1912, p. 292 ; Bouvier, 1912a, p. 919 ; Bouvier, 1913, p. 464 ; Bouvier, 1925, p. 200, figs. 428-431 ; J. Roux, 1934, p. 530.

## MADAGASCAR INSTITUTE :

- Bekily, N of Imanombo, Onilahy River basin, S Madagascar; August 1948; J. Millot. — 7 specimens.
- Betroka, about 150 km S of Ihosy, Onilahy River Basin; July 1948; J. Millot. — 5 specimens.
- Bezaha on Onilahy River; April 1953; P.A. Robinson. — 4 specimens.
- Sept Laes, Tongobory, Onilahy River basin; May 1951; R. Paulian. — 20 specimens.
- Ankazoabo, SW Madagascar; November 1936; P.A. Robinson. — 21 specimens.
- Ankaramena, Mangoly River basin, SW Madagascar; April 1955; E. Razafiman-dimby. — 13 specimens.

## AUSTRIAN MADAGASCAR EXPEDITION :

- Iritsoka brook, a few km N of Betroka, S of Ihosy, Onilahy River basin; 13 September 1958; F.M. 222. — 14 specimens (1 ovigerous).
- Brook near Ambohimanelona, SE of Tuléar, on the highway to Tongobory, Onilahy River basin, SW Madagascar; 4 September 1958; F.M. 190. — 25 specimens (3 ovigerous).

## MUSEUM LEIDEN :

- Iritsoka Brook near km 94 on the highway from Ihosy to Fort-Dauphin, 24 km N of Betroka, Betroka district, Tuléar province, S Madagascar; 13 September 1958; Y. Thezen no. 38, récolte no. 49. — 3 specimens.

The specimens are 7 to 24 mm long, the ovigerous females being 14 to 24 mm.

The rostrum in typical specimens reaches to the base or to the middle of the second segment of the antennular peduncle, seldom the end of the segment is reached. The tip is often slightly curved up. The upper margin of the rostrum is typically unarmed; a few (6 of 78) specimens in some of the lots examined (from Iritsoka, Bekily, Betroka) showed some (1 to 7) dorsal teeth, in the lot from Ankazoabo there were 9 specimens with (3 to 12) dorsal teeth. The rostrum is high in some specimens, being much flatter in others. The lower margin bears 0 to 2 seldom up to 4 teeth.

The lower orbital angle is not very distinct, generally it is folded inwards so that it seems as if the antennal spine is placed on this lower angle. The antennal spine is distinct and sharply pointed. The pterygostomial angle is rounded and only slightly produced.

The dorsal surface of the telson bears 2 to 5, usually 3 pairs of spinules. The posterior margin is rounded; the outer spines are short and less than 1/4 of the length of the laterals, the intermediate spines are 3 to 9 in number and are shorter than the laterals.

The eyes are well developed. The antennular peduncle is rather slender. The stylocerite is sharp, reaches beyond the middle of the basal segment of the antennular peduncle, but fails to reach the end. The anterolateral tooth of the segment is much shorter than half the second segment of the peduncle. The antennal peduncle shows a usually distinct, often rather broad and inconspicuous spine near the base of the scaphocerite.

Epipods are present on the bases of the first four pereopods.

The carpus of the first pereopod is usually not very deeply excavated anteriorly, it is 1.7 to 2.5 times as long as high, it is as long as the merus and shorter than the chela. The carpus of the second leg is about 4 to 5.5 times as long as high; it is longer than both merus and chela. The dactylus of the third leg bears 4 to 6 rarely 7 teeth on the posterior margin. The propodus is 3 to 4 times as long as the dactylus. Also in the fifth leg the propodus is 3 to 4 times the length of the dactylus.

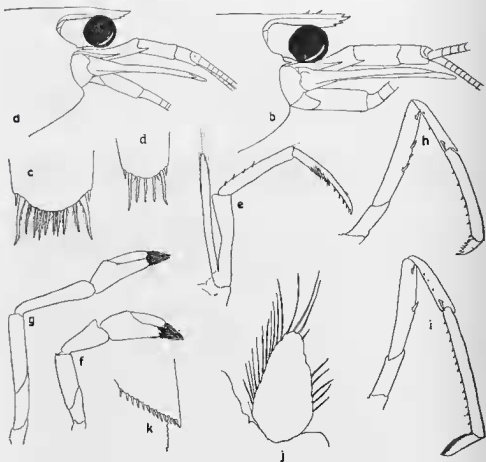


FIG. 10. — *Caridina isaloensis isaloensis* Coutière, from Iritsoka rivulet, F.M. 222. a, b, anterior part of the body in lateral view; c, d, tip of telson; e, third maxilliped; f, first pereopod; g, second pereopod; h, third pereopod; i, fifth pereopod; j, endopod of first pleopod of male; k, outer part of diaeresis. a, b, e-i,  $\times 16$ ; c, d, k,  $\times 32$ ; j,  $\times 64$ .

The endopod of the first pleopod of the male is ovate and bears no appendix interna.

The preanal carina is rounded without a tooth.

The diaeresis of the uropodal exopod bears 7 to 12, sometimes 13 spinules.

The eggs are rather large, measuring  $0.5-0.65 \times 0.8-1.0$  mm.

The present species seems to have a rather wide distribution in Madagascar, but is represented by at least two local subspecies which gradually merge into each other.

The main characteristic of the present, typical subspecies is the short, dorsally unarmed rostrum. In some populations there are specimens in which the rostrum shows some dorsal spinules; these specimens form a transition to the next subspecies *C. i. grandidieri* Bouvier. The typical subspecies seems to inhabit the SW corner of Madagascar.



BOUVIER (1925) distinguished *C. isaloensis* from *C. madagascariensis* and treated the two as distinct species. However, the differences mentioned by BOUVIER fall within the range of variation of the species and I cannot find any good reason not to synonymize the two.

The species is only known from Madagascar. The type locality is the Onilahy River in SW Madagascar (COUTIÈRE, 1899). COUTIÈRE (1900) reported the species from "Madagascar (côte est)", which clearly is an error as the original description gives "(Côte Ouest)". BOUVIER (1904) reported on about 40 specimens collected by GRANDIDIER in 1898 between Salvamby and Manasco (spelled later by BOUVIER, 1925 : Saloambany and Manasca); as the size of the lot, the collector and the approximate date are the same as those of the type lot, I agree with BOUVIER (1925) that it probably is the type lot. The other records of the typical subspecies are : Madagascar (BOUVIER, 1905, 1912, 1913), Mahafaly, Tranoroa region, S Madagascar (J. ROUX, 1934), Andranolaho, Onilahy River, Betsioky district (BOUVIER, 1925; locality misspelled Andrandabo), Tuléar (J. ROUX, 1934), Andranakanga, Ambongo near Namoroka (J. ROUX, 1929), Ankavandra (BOUVIER, 1925), Fandramanona River (BOUVIER, 1904; BOUVIER, 1905; BOUVIER, 1925; locality in 1925 misspelled Fandriamanana). The last mentioned locality is not known to Dr. PAULIAN, it is possible that not only the second but also the first spelling is incorrect; this is the more to be regretted as the locality is the type locality of both *C. madagascariensis* Bouvier and *C. grandidieri* Bouvier.

#### *Caridina isaloensis grandidieri* Bouvier (fig. 11)

*Caridina Grandidieri* Bouvier, 1904, p. 133; Bouvier, 1905, p. 87, fig. 9; Bouvier, 1912, p. 293; Bouvier, 1912a, p. 919; Bouvier, 1913, p. 464; Bouvier, 1925, p. 200, figs. 423-426.

##### MADAGASCAR INSTITUTE :

- Ihosy, basin of Mangoky River; July 1948; J. Millot. — 12 specimens.
- Canyon of Manambolo River, W Madagascar; pool in torrent near highway; July 1949. — 7 specimens.
- Betsingily on Manambolo River; July 1949; R. Paulian. — 2 specimens.
- 23 km S of Ankavandra, Manamboto River; pool in torrent; R. Paulian. — 16 specimens.
- 20 km S of Ankavandra, Manambolo River; pool in a torrent; under a piece of wood; 2 May 1949; P. Cachan. — 27 specimens.
- Bekopaka, S of Antsingy, Manambolo River basin; July 1949; R. Paulian. — 36 specimens (3 ovigerous).
- N of Antsingy. — 13 specimens.
- Ambina, N of Antsingy; July 1949; R. Paulian. — 16 specimens.
- Morafénobé, Mahajéby forest, W Madagascar; May 1952; R. Paulian. — 15 specimens.
- Namoroka, WSW of Kinkony Lake, NW Madagascar; in brook; September 1952; R. Paulian. — 4 specimens.
- Ampijoroa, Ankarafantsika, 30 km SE of Marovoay on the highway Majunga-Tananarive; alt. 120 m; P. Grlo; 4 September 1956. — 8 specimens (2 ovigerous).
- Maromandia, N Madagascar; torrent; July 1948; J. Millot. — 9 specimens.
- Ambllobé, N Madagascar; Mananjéba River, April 1951; R. Paulian. — 3 specimens (1 ovigerous).

##### MUSEUM LEIDEN :

- Ampomblava, Befandriana du Nord district, Majunga province, N Madagascar; 24 June 1959; Y. Theresien no. 45, récolte no. 115. — 6 specimens.

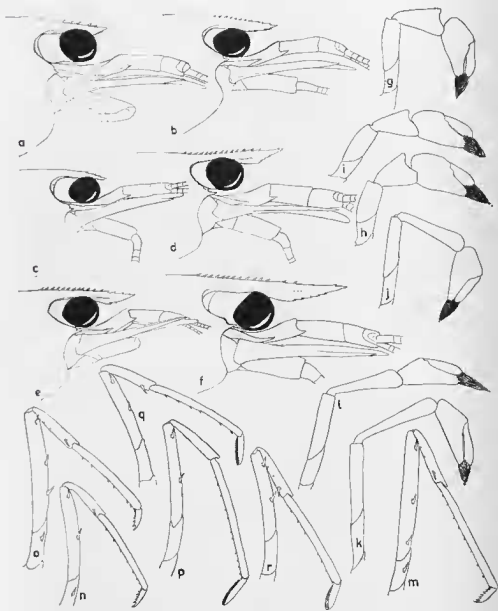


FIG. 11. — *Caridina isaloensis grandidieri* Bouvier. *a-f*, anterior part of body in lateral view; *g-l*, first pereopod; *j-l*, second pereopod; *m-o*, third pereopod; *p-r*, fifth pereopod. *a-r*,  $\times 16$ . *a-c*, *g*, *h*, *j*, *k*, *m*, *n*, *p*, *q*, specimens from N. of Antsingy; *d-f*, *i*, *l*, *o*, *r*, specimens from Manambolo River, 20 km S. of Ankavandra.

This subspecies is very closely related to the typical subspecies and the only worthwhile difference that I could find is in the shape and dentition of the rostrum. The rostrum is somewhat longer, reaching the middle or

the end of the second segment of the antennular peduncle (though in some specimens it only reaches the base of this segment and in very few it is somewhat longer). The upper margin of the rostrum bears as a rule 6 to 18 teeth, seldom less (2 to 5) or more (19 to 24); of these 0 to 2 are placed behind the orbit, sometimes the distal teeth are wider spaced than the proximal, in a few cases the distalmost part of the upper margin is unarmed. The teeth are short. The lower margin bears 0 to 10 teeth, which often are very inconspicuous. The rest of carapace is as in the typical subspecies, as are also the cephalic and thoracic appendages.

The diaeresis bears 8 to 13 (seldom 15) spinules, in the northernmost lots, viz., those from Maromandia and Ambilobe these spinules are up to 19 in number.

This subspecies occupies a locality in W Madagascar north of that from which the typical subspecies is known. Intermediate forms between the two subspecies are found, and it is difficult to draw the exact line between the two, it seems best, however, to keep these two forms separate. The type locality of the present subspecies is Fandiamanana River, the exact position of which unfortunately is not known, it is possible that BOUVIER spelled the name wrong (the spelling Fandramanona River has also been used by BOUVIER for this river). BOUVIER (1904) doubtfully referred specimens from Mavataha (situation unknown to me) to the present form. There are no other records known.

### *Caridina norvestica* n. sp. (fig. 12)

#### MADAGASCAR INSTITUTE :

- River N of Majunga ; December 1951 ; R. Paulian. — 6 specimens (1 ovigerous).
- Near Majunga, small brook at km 530 of the highway to Tananarive ; October 1949 ; R. Paulian. — 14 specimens.
- Mahajamba Lake ; October 1949 ; R. Paulian. — 6 specimens (2 ovigerous).

The specimens are 12 to 20 mm long ; the ovigerous females measure 19 to 20 mm.

In *C. norvestica* the rostrum is long, in the adults it reaches to or slightly beyond the end of the antennular peduncle, and as a rule is curved upward at the end. In juveniles it may reach slightly beyond the base of the second segment of the peduncle. One or two subapical teeth are present, behind which there is a conspicuous unarmed portion. In the basal part of the rostrum there are 10 to 27 teeth ; in the adults the number of these teeth (19 to 27) is much higher than in juveniles (10 to 18). One or two of these teeth are placed behind the posterior margin of the orbit. The lower margin of the rostrum has 4 to 15 teeth, here too the number is higher in the larger specimens than in the smaller.

The lower orbital angle is distinct and narrowly rounded. The well developed antennal spine is placed some distance below the orbital angle. The pterygostomial angle is rounded and only slightly produced.

The 6th abdominal somite is 0.6 to 0.7 times the length of the carapace.

The dorsal surface of the telson bears 3 or 4 pairs of spines. The posterior

margin of the telson is rounded the outer spines are very short the laterals are more than 4 times longer. The intermediate spines are 3 to 5 in number and are almost as long as the laterals. The preanal carina is blunt.

The eyes are well developed and rather large. The antennal ridge is somewhat elevated and rounded. The stylocerite is sharp and slender, reaching beyond the middle of the first antennular segment, but failing to attain the end. The anterolateral tooth of the segment is well developed but fails to reach the middle of the quite slender second antennular segment. The scaphocerite is slender, the spine near its base is broadly triangular and inconspicuous.

Epipods are present at the bases of the first four pereopods. The carpus of the first cheliped is 1.2 to 2.2 times as long as high, it is of about the same length as the merus and shorter than the chela, it is not deeply excavate anteriorly. The carpus of the second cheliped is about 5 to 5.5 times as long as high; it is distinctly longer than either chela or merus. The dactylus of

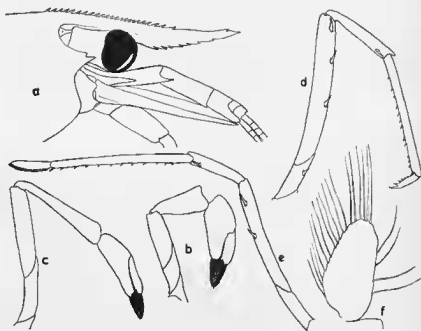


FIG. 12. — *Caridina norvestica* new species, from near Majunga. a, anterior part of body in lateral view; b, first pereopod; c, second pereopod; d, third pereopod; e, fifth pereopod; f, endopod of first pleopod of male. a-e,  $\times 16$ ; f,  $\times 64$ .

the third pereopod bears 5 to 7 teeth on the posterior margin. The propodus is about 3.7 to 4 times as long as the dactylus. The carpus bears one strong movable spine in the distal part of its outer surface, the merus also possesses such a spine and has moreover 2 more placed lower down near the posterior margin of the segment. One such spine is present on the ischium. The dactylus of the fifth leg bears a row of numerous comb-like arranged spinules on

the posterior margin. The propodus is about 3.5 to 4.3 times as long as the dactylus and bears several small posterior spinules. The carpus bears a movable spine similar to that of the carpus of the third leg. In the merus there are usually only 2 instead of 3 spines, while the ischium shows no spine at all.

The endopod of the first pleopod of the male is ovate without an appendix interna. The appendix masculina of the second pleopod is somewhat longer and broader than the appendix interna. The diaeresis of the exopod of the uropod bears 9 to 15 spinules.

The eggs measure  $0.5-0.7 \times 0.8-1.0$  mm.

The present species is closely related to *C. isaloensis* and agrees with that species in the general shape of the appendages, the telson and the antennal spine. The most important difference being that of the rostrum, which especially in adult specimens is greatly different. However, it may ultimately prove necessary to reduce the present species to the rank of a subspecies of *C. isaloensis*.

#### *Caridina trogliphila* n. sp. (fig. 13)

*Caridina* ? *gladiifera* Holthuis, 1956, p. 65.

##### MADAGASCAR INSTITUTE :

— Anbovonomy cave, Namoroka, NW Madagascar; September 1952; R. Paulian.  
— 32 specimens.

The specimens measure 14 to 25 mm.

The rostrum is rather high it reaches to or slightly beyond the end of the antennular peduncle, it is straight or slightly curved up at the tip. The upper margin is beset by 23 to 35 teeth, 4 to 6 of which are placed behind the posterior orbital margin. The teeth are small, the distalmost are smallest, often rather inconspicuous and more widely spaced than the proximals. The lower margin bears 5 to 9 teeth; these are low and not distinctly set off from the body of the rostrum, resembling thereby the distalmost dorsal teeth.

The antennal spine is well developed and sharp, it is placed some distance below the rounded orbital angle. The pterygostomian angle is broadly rounded, and may be slightly produced.

The sixth abdominal somite is about  $2/3$  of the length of the carapace (rostrum excluded). The telson bears dorsally 4 or 5 pairs of spines. The posterior margin of the telson is not rounded but narrowed in three steps resembling thereby the stepped gable of old dutch houses. The outer pair of posterior spines is short, being less than  $1/4$  of the length of the long lateral spines. The intermediate spines are 3 to 5 in number; they are shorter, but not very much shorter, than the lateral spines, and are simple, not divided. The preanal carina is blunt, without a spine.

The eyes are well developed, but still relatively smaller than in related species like *C. norvestica*. The cornea is distinctly pigmented and globular. The antennular carina is rather distinct and somewhat produced. The

stylocerite is slender and pointed, it reaches a little beyond the middle of the basal segment of the antennular peduncle. The antero-lateral tooth of the segment is slender and sharp but falls far short of the middle of the second segment.

The scaphocerite reaches somewhat beyond the rostrum. The blade distinctly overreaches the final tooth. There is a sharp, well developed spine on the outside of the antennular peduncle near the base of the scaphocerite.

The branchial formula is normal. The first four pereopods each bear an epipod at the base.

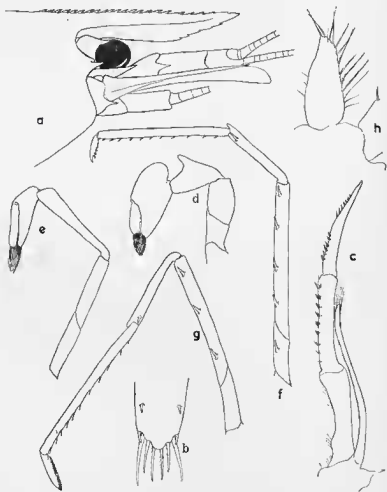


FIG. 13. — *Caridina troglolitha* new species, from Ambovononmy cave. a, anterior part of body in lateral view; b, tip of telson; c, third maxilliped; d, first pereopod; e, second pereopod; f, third pereopod; g, fifth pereopod; h, endopod of first pereopod of male. a, c-g,  $\times 16$ ; b, f,  $\times 32$ ; h,  $\times 50$ .

The third maxilliped reaches as far as the final tooth of the scaphocerite. Its distal segment is about as long as the penultimate and bears spines in the distal half of its lower margin. The first pereopod is short and stubby. The carpus is almost 1.5 times as long as high, it is deeply excavated anteriorly, it is longer than the merus but shorter than the chela. The fingers are slightly shorter than the palm. The second legs are slender. The carpus is 5 times as long as high, it is longer than both the merus and the chela. The fingers are distinctly longer than the palm. The dactylus of the third leg bears about 6 teeth on the posterior margin. The propodus is about 3 1/2 to 4 1/2 times the length of the dactylus. The carpus bears the usual movable spine, while the merus as a rule shows 4 movable spines on the outer surface near the posterior margin. The ischium also bears a spine. In the fifth leg the dactylus is provided on the posterior margin with a row of many comb-like arranged spinules. The propodus is almost 4 times as long as the dactylus. The carpus bears one, the merus three movable spines.

The endopod of the first male pleopod is ovate, without any trace of an appendix interna. In the second male pleopod the appendix masculina is shorter than the appendix interna and bears an apical tuft of bristles. The diaeresis of the uropodal exopod bears 8 to 11 spinules.

No ovigerous females are present.

The present species may be immediately distinguished from the related forms by the shape of the rostrum, the large number of dorsal rostral teeth of which 4 to 6 are placed behind the orbit, and by the shape of the telson.

The type lot was doubtfully identified by me in 1956 as *C. gladiifera* J. Roux. Now that I have material of that species at my disposal it is clear that the present material forms an independent species.

### *Caridina lamiana* n. sp. (fig. 14)

#### MADAGASCAR INSTITUTE :

— Ambodivoangy near Maroantsetra, Antongil Bay, NE Madagascar; in torrent; 1946; J. Millot. — 2 specimens.

#### MUSEUM LEIDEN :

— Forest between 20 and 30 km NW of Ambahoabé, Simjanona River, N of Soanlerana, eastcoast of Madagascar; 8 December 1938; H. J. Lam & A. D. J. Neuse. — 28 specimens (4 ovigerous).

The specimens are 9 to 17 mm long; the ovigerous females measure 15 to 17 mm.

The rostrum is short and reaches about to the end of the basal segment of the antennular peduncle, in juveniles it fails to attain the end of the eyes. It is rather high, and is not armed, neither dorsally nor ventrally.

The antennal spine is rather broad and short, often showing as only a mere angle. It stands below the lower orbital angle which is strongly folded inward and therefore hidden from view. The pterygostomian angle is rectangularly rounded and hardly produced forward.

The sixth abdominal somite is about 0.5 to 0.6 times as long as the carapace. The telson bears 4 or 5 pairs of dorsal spines. Its posterior margin

is rounded. The outer pair of spinules is very short, measuring less than 1/4 of the length of the lateral spines, which are very long and strong. There are 6 to 10 intermediate spines which are considerably shorter than the laterals. The preanal carina is rounded, without spine.

The eyes are well developed with globular dark-pigmented cornea.

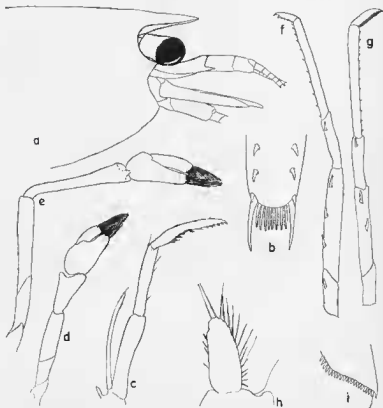


FIG. 14. — *Caridina lamiana* new species, from Simianona River. a, anterior part of body in lateral view; b, tip of telson; c, third maxilliped; d, first pereopod; e, second pereopod; f, third pereopod; g, fifth pereopod; h, first pleopod of male; i, outer part of diaeresis. a, c-g,  $\times 16$ ; b, i,  $\times 32$ ; h,  $\times 50$ .

The antennular carina is dorsally produced to a high tooth-like elevation. The antennular peduncle is rather robust, with short segments. The stylocerite is sharp and pointed and fails to attain the end of the first segment of the antennular peduncle. The anterolateral tooth of the first segment is sharply pointed, it does not attain the middle of the second segment. The scaphocerite has the final tooth rather broad, it is distinctly overreached by the lamella. A distinct triangular tooth is placed at the external side of the antennal peduncle near the base of the scaphocerite.

The branchial formula is normal. Epipods are present at the bases of the first four pereopods. The third maxilliped reaches with 1/2 or 1/3 of the distal segment beyond the final tooth of the scaphocerite, sometimes



it barely attains that tooth. The distal segment is about as long as the penultimate and bears some teeth in the distal half of the posterior margin.

The carpus of the first pereiopod is about twice as long as high and distinctly hollowed anteriorly. The carpus is as long as the merus and shorter than the chela. The chela is very heavy, with the fingers about as long as the palm. The second legs are slender. The carpus is 5 times as long as high, it is longer than either merus or chela. The fingers of the chela are much longer than the palm. The third pereiopod has 5 or 6 small denticles on the posterior margin of the dactylus. The propodus is 3.5 to 4.5 times as long as the dactylus. The carpus and ischium bear one, the merus three movable spines near the posterior margin. The dactylus of the fifth leg is provided with many comb-like arranged spinules on the posterior margin. The propodus is 3.0 to 3.5 times as long as the dactylus. The carpus bears one, the merus two (sometimes three) and the ischium no movable spines near the posterior margin.

The endopod of the first pleopod of the male is ovate and bears no appendix interna. In the second male pleopod the appendix masculina is about twice as long and twice as broad as the appendix interna, it bears strong spines in the distal half and in two rows over the larger part of its length. The diaeresis of the uropodal exopod bears 20 to 23 spinules.

The eggs are large, measuring  $0.7 \times 1.1-1.2$  mm.

The species, in having no dorsal teeth on the rostrum, resembles *C. i. isaloensis*, but may be easily distinguished from that species by the high number of spinules on the diaeresis.

This new species is named for Dr. H. J. LAM, Professor of Systematic Botany at Leiden University and Director of the Rijksherbarium, who together with Dr. MEEUSE collected the type material. It is a pleasure for me to be able in this way to express my high esteem for Dr. LAM and my appreciation for his guidance in the field of taxonomy.

### *Caridina xiphias* Bouvier (fig. 15, 16)

*Caridina nilotica stylirostris* Bouvier, 1925, p. 148, fig. 309.

*Caridina nilotica xiphias* Bouvier, 1925, p. 149, figs. 310-312; J. Roux, 1929, pp. 304-318.

*Caridina gladiifera* J. Roux, 1929, pp. 306, 319, fig. 16.

#### MADAGASCAR INSTITUTE :

- Andranomalaza, East of Manakambahiny, eastern shore of Alaotra Lake, E Madagascar; April 1956. — 2 specimens.
- Anove, Manambato, east coast of Madagascar N of Tamatave; February 1955; P. A. Robinson. — 1 specimen.
- Périnet, 25 km east of Moramanga, E Madagascar; August 1916; J. Millet. — 4 specimens (3 ovigerous).
- Périnet, in brook; 3 March 1950; J. Doucet. — 1 specimen.
- Périnet; 22 September 1954; E. Razafimaninby. — 2 specimens.
- Périnet; March 1955. — 2 specimens.
- Périnet; mountain torrent in forest, in pool at base of cascade; 15 December 1955; B. Stuckenberg. — 8 specimens (4 ovigerous).
- North of Anosibé, 30 km S of Moramanga; in forest; January 1951; R. Paulian. — 4 specimens (1 ovigerous).
- Ifanadlana, torrent of Ranomafana, E Madagascar; May 1951; R. Paulian. — 24 specimens.

## AUSTRIAN MADAGASCAR EXPEDITION :

- Source in virgin forest near Mandraka, 68 km E of Tananarive ; 22 July 1958 ; F.M. 86. — 12 specimens.
- Analamazaotra brook, Périnet ; 28 July 1958 ; F.M. 102. — 1 specimen.
- Effluent from Lac Vert, Périnet ; 23 July 1958 ; F.M. 105. — 3 specimens.
- Brook emptying in Lac Vert, Périnet ; 28 July 1958 ; F.M. 109. — 18 specimens
- Brook emptying in Lac Rouge, Périnet ; 23 July 1958 ; F.M. 111. — 10 specimens.
- Brook near Lac Rouge, Périnet ; 23 July 1958 ; F.M. 112. — 6 specimens.
- Source in virgin forest near Périnet ; 28 July 1958 ; F.M. 113. — 1 specimen.
- Brook in virgin forest, Périnet ; 31 July 1958 ; F.M. 120. — 31 specimens (1 ovigerous).
- Virgin forest near Périnet ; 28 July 1958 ; T. 124. — 1 specimen.

## MUSEUM LEIDEN :

- Beforona River, Périnet region, Moramanga district, Tamatave province, Central Madagascar ; 11 February 1961 ; native name « orana » ; Y. Therezien no. 10. — 1 ovigerous female.
- Brook at Périnet station, Moramanga district ; 12 May 1962 ; native name « patsa » ; Y. Therezien no. 12. — 13 specimens (2 ovigerous).
- Ambodiriana, Moramanga district ; 30 October 1958 ; Y. Therezien no. 43, récolte no. 12-14. — 1 specimen.
- Analamazaotra River, Périnet, Moramanga district ; 29 July 1958 ; Y. Therezien no. 44, récolte no. 6-11. — 9 specimens.
- Ampamaherana River, Fianarantsoa district, Fianarantsoa province, E Madagascar ; 29 November 1961 ; native name « patsa » ; Y. Therezien no. 15. — 13 specimens (4 ovigerous).

The specimens are 7 to 26 mm long, the ovigerous females measure 21 to 26 mm.

The rostrum is variable in length. In adults it may overreach the scaphocerite by slightly less than half the length of that scale. In juveniles it may be much shorter and even fail to reach the base of the last segment of the antennular peduncle. In juveniles it usually is straight, in adults it may be curved upwards in the distal part. The upper margin is unarmed distally, even a subapical tooth is absent. The unarmed portion in adults may be up to twice as long as the armed part ; in juveniles the unarmed portion may be as short as half the length of the armed part. The number of dorsal teeth on the rostrum varies between 4 (in juveniles) and 16 (in adults). 0 to 3 of these teeth are placed behind the posterior limit of the orbit. The ventral margin bears 0 (in very young specimens) to 12 teeth.

The lower orbital margin is distinctly separated from the antennal spine which is well developed and sharply pointed. The pterygostomian angle is rounded and somewhat forward produced.

The telson bears 3 to 5, usually 3 or 4, dorsal pairs of spines. The posterior margin of the telson is rounded without a median spine. The outer pair of spines is very short, less than 1/4 of the length of the laterals. There are 5 to 9 intermediate spines, which are shorter, though not very much shorter than the laterals. The preanal carina is blunt, without a spine.

The stylocerite reaches beyond the middle of the basal antennular segment, but does not attain the end of it, though it often comes quite close. The anterolateral tooth of the basal segment is sharp and long ; in some cases it almost reaches the middle of the second segment, but usually falls distinctly short of that. There is a distinct spine at the external side of the antennal peduncle near the base of the scaphocerite.

The branchial formula is normal. Epipodites are present at the bases of the first four pereopods.

The carpus of the first pereopod is about as long as the merus, twice

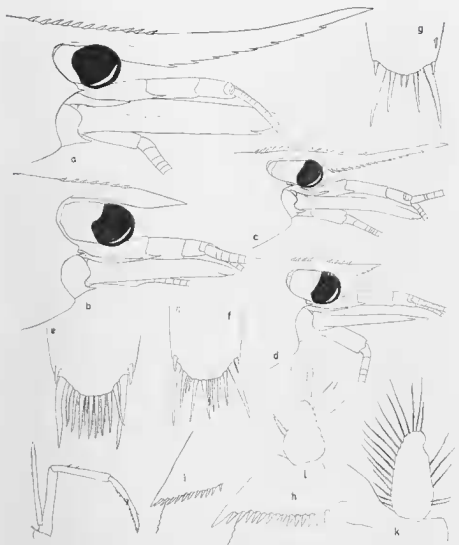


FIG. 15. — *Caridina ziphias* Bouvier. *a-d*, anterior part of body in lateral view; *e-g*, tip of telson; *h, i*, outer part of diaeresis; *j*, third maxilliped; *k, l*, endopod of first pleopod of male. *a, c, d, f*,  $\times 13$ ; *b*,  $\times 26$ ; *e, h*,  $\times 40$ ; *f, g, i, k, l*,  $\times 50$ . *a, b, e, h*, specimen from brook near Lac Rouge, Périnet, F.M. 111; *c*, specimen from Périnet, March 1955; *d, f, g, i, j, l*, specimen from Ifanadiana; *k*, specimen from Périnet, F.M. 120.

or less than twice as long as high and shorter than the chela. The carpus of the second pereopod is longer than either merus or chela, it is 4.5 to 5 times as long as high. The dactylus of the third leg bears 5 or 6 spinules on the posterior margin. The propodus is 4 to 4.5 times as long as the dactylus. The propodus of the fifth leg is 3 to 4 times as long as the dactylus.

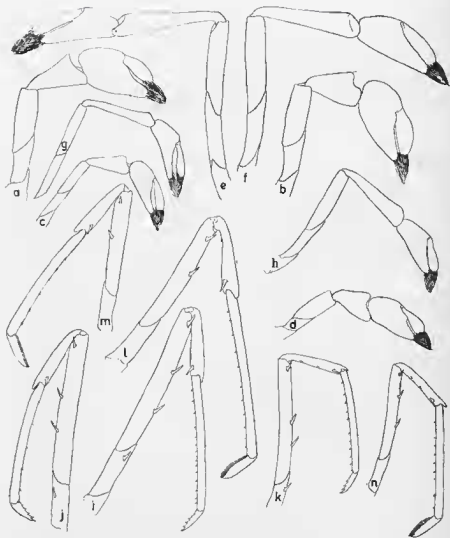


FIG. 16 — *Caridina ziphius* Bouvier. *a-d*, first pereopod; *e-h*, second pereopod; *i-k*, third pereopod; *l-n*, fifth pereopod. *a, c-e, g-i, k, l, n*,  $\times 16$ ; *b, f, j, m*,  $\times 32$ . *a, b, e, f, i, j, l, m*, specimen from brook near Lac Rouge, Périnet, F.M. 111 (*b, f, j, m*, juvenile specimen); *c, g*, specimen from Périnet, March 1955; *d, h, k, n*, specimen from Ifanadiana.

The endopod of the first pleopod of the male has no appendix interna. The diaeresis of the uropodal exopod bears 9 to 20 spinules (more in the adult than in the very young).

The eggs measure  $0.5-0.7 \times 0.9-1.2$  mm.

The present species superficially resembles *Caridina nilotica* very much and for that reason has been treated by BOUVIER (1925) as a subspecies of it. There can be not the least doubt, however, that the two forms constitute

distinct species. The most important differential character in my opinion being found in the shape of the endopod of the first pleopod of the male, which in *C. nilotica* (as well as in *C. longirostris*) is provided with a well developed appendix interna, while such an appendix is entirely absent in *C. xiphias*. *C. xiphias* furthermore is readily distinguishable from *C. nilotica* by the lack of subapical teeth on the rostrum (in *C. nilotica* these teeth may be absent in abnormal or damaged specimens), the more produced pterygostomian angle of the carapace and the fewer teeth on the rostrum.

As shown by my material several of the characters of this species show a great variation, which is either individual or due to age. A comparison of the characters with the original descriptions of both *Caridina nilotica xiphias* Bouvier, 1925, and *C. n. stylirostris* Bouvier, 1925, shows that these forms both belong to the present species. BOUVIER's specimens of *C. n. xiphias* were immature, as stated by that author, those of *C. n. stylirostris* were adult. The names *xiphias* is retained here for the species.

J. Roux (1929) dealt with *C. n. xiphias* and described the new species *Caridina gladiifera*. As Roux himself already pointed out his new species has many characters in common with *C. n. xiphias*. The most conspicuous difference being the greater number of spines on the diaeresis of the uropodal exopod. As shown by the present material this difference is of little value and *Caridina gladiifera* in my opinion must be considered a synonym of *C. xiphias* as also the other characters do not fall out of the range of variation shown by the species.

The character of the presence or absence of subapical dorsal teeth on the rostrum, though very useful for the distinction of *C. xiphias* and *C. nilotica*, cannot be always relied upon. In some specimens of *C. nilotica* these spines are absent probably due to some accident, while in *C. xiphias* I saw once a specimen with an indication of a subapical spine. The type specimens of *Caridina voeltzkowi* Lenz (1910, p. 569) were described by LENZ as having no subapical dorsal teeth, still the few other characters of the specimens provided by LENZ (e.g., the rostral formulae) show that the specimens are more probably *C. nilotica*; this is confirmed by J. Roux (1929, p. 302) who evidently examined LENZ's specimens and identified them as *C. nilotica paucipara*.

*Caridina xiphias* is only known from Madagascar. The type locality is Didy, Ambatondrazaka district, province Moramanga, E Madagascar. The localities whence the species has been reported in the literature are: Madagascar (BOUVIER, 1925), Didy (BOUVIER, 1925; J. ROUX, 1929), Périnet, 25 km east of Moramanga, E Madagascar (J. ROUX, 1929), Namoroka and Kapiloza Rivers, Ambongo, W Madagascar (J. ROUX, 1929). It is possible that J. Roux's specimens from W Madagascar do not belong here. Juvenile specimens of this species and those of *C. isaloensis grandidieri* often resemble each other so strongly that it is impossible to tell them apart.

#### *Caridina hova* Nobili (fig. 17)

*Caridina hova* Nobili, 1905, p. 1, 3 figs.; Bouvier, 1925, p. 186, fig. 390; Decary, 1950, p. 167.

AUSTRIAN MADAGASCAR EXPEDITION:

— Mandromodromotra brook, 20 km N of Fort-Dauphin, SW Madagascar; 11 September 1958; F.M. 217. — 10 specimens (2 ovigerous).

— Source in marsh 20 km N of Fort-Dauphin; 11 September 1958; F.M. 220. — 1 specimen.

MUSEUM LEIDEN :

— Mandromodromotra brook, Piste Elandy, Fort-Dauphin district, Tuléar province SE Madagascar; 11 September 1958; Y. Y. Therezien no. 36, récolte no. 46. — 2 specimens.

The specimens are 8 to 18 mm long. The ovigerous females measure 17 and 18 mm.

The rostrum reaches to the base or the end of the second segment of the antennular peduncle. It is straight and bears dorsally 14 to 20 teeth, 3 of which are placed behind the posterior limit of the orbit. These teeth

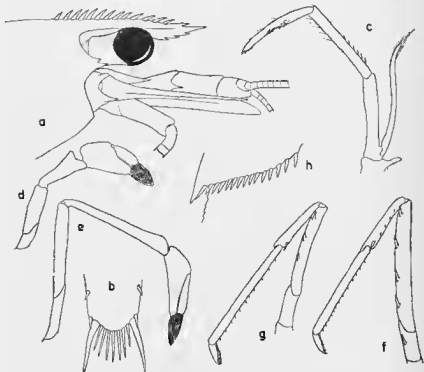


FIG. 17. — *Caridina nova* Noblii, from Mandromodromotra brook. a, anterior part of body in lateral view; b, tip of telson; c, third maxilliped; d, first pereopod; e, second pereopod; f, third pereopod; g, fifth pereopod; h, outer part of diaeresis. a, c-g,  $\times 16$ ; b, h,  $\times 32$ .

are striking by their large size and form the most conspicuous characteristic of the species. The teeth are evenly distributed over the rostrum. The lower margin bears 3 or 4 distinct teeth. The lower orbital angle is distinct and acutely rounded. The antennal spine is strong and placed some distance below the orbital angle. The pterygostomial angle is rectangularly rounded.

The telson bears 4 or 5 pairs of dorsal spines. The posterior margin is rounded. The outer spines are less than  $1/4$  as long as the laterals. The intermediate spines are 5 to 7 in number and are about half as long as the laterals. The pre-anal carina is bluntly rounded without a spine.

The eyes are well developed. The stylocerite reaches beyond the middle of the basal segment of the antennular peduncle but does not attain the

end of the segment. The anterolateral tooth of the segment is sharp, but does not reach the middle of the second segment. The antennal peduncle bears a strong spine in its external part near the base of the scaphocerite.

The branchial formula is normal. Epipodites are present at the bases of all 4 pereopods. The distal segment of the third maxilliped is about as long as the penultimate. The carpus of the first pereopod is fully 2.5 times as long as high, it is about as long as the merus and only slightly shorter than the chela. The second leg has the carpus 6 to 8 times as long as high, being longer than either merus or chela; the fingers of the chela are slender and distinctly longer than the palm. The dactylus of the third pereopod bears about 6 teeth on the posterior margin; the propodus is about 5 times as long as the dactylus. The propodus of the fifth leg is 4 times as long as the dactylus, which bears numerous comb-like arranged spinules on the posterior margin.

The endopod of the first pleopod of the male bears no appendix interna. The diaeresis of the uropodal exopod is provided with 15 to 17 spinules.

The eggs measure  $0.65-0.7 \times 1.1$  mm.

*Caridina hova* is so far only known from SE Madagascar. NOBILI (1905) reported it from Fort-Dauphin and since that time no new finds of the species have been published. The present material also originates from the Fort-Dauphin area.

#### *Caridina brevirostris brevipes* Bouvier

*Caridina brevirostris brevipes* Bouvier, 1925, p. 230.

The status of this form, of which no material has been examined by me is dubious. BOUVIER only provided a very short description of it, based on two specimens from the Bay of Amposindova, opposite Nosy Bé, NW Madagascar.

#### Genus *ATYA* Leach, 1816

So far only one species of this genus is known from Madagascar.

#### *Atya pilipes* Newport

*Atya pilipes* Newport, 1847, p. 160.

*Atya brevirostris* Coutière, 1900, p. 1267.

*Atya serrata* Bouvier, 1925, p. 294.

#### MUSEUM LEIDEN :

— Rivulet of Besokatra, Diégo-Suarez district, Diégo-Suarez province, N Madagascar; 25 April 1959; Y. Therezien no. 40, récolte no. 103. — 1 female.

The specimen is 40 mm long. It agrees quite well with the descriptions given in the literature of this species. It belongs to the form which BOUVIER (1925, p. 294) described under the name *Atya serrata* Bate.

Previous records of the species from Madagascar are the following : Cap d'Ambre, northpoint of Madagascar (COUTIÈRE, 1900), and the island Sainte-Marie, E Madagascar (BOUVIER, 1925).

*Atya pilipes* has a wide distribution throughout the Indo-West Pacific region, viz., from Madagascar and the Seychelles to Polynesia.

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